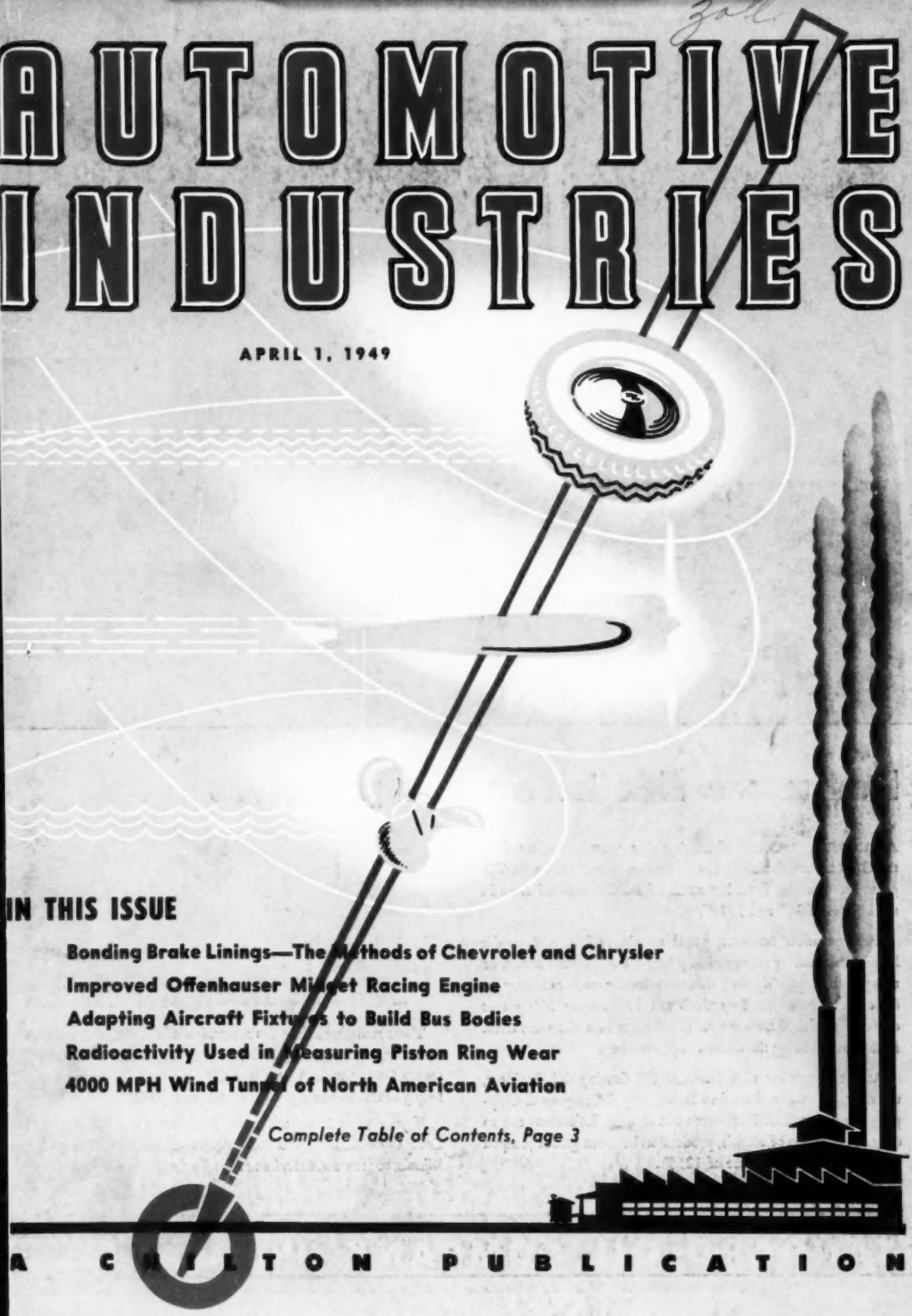
AUTOMOTIVE INDUSTRIES

APRIL 1, 1949



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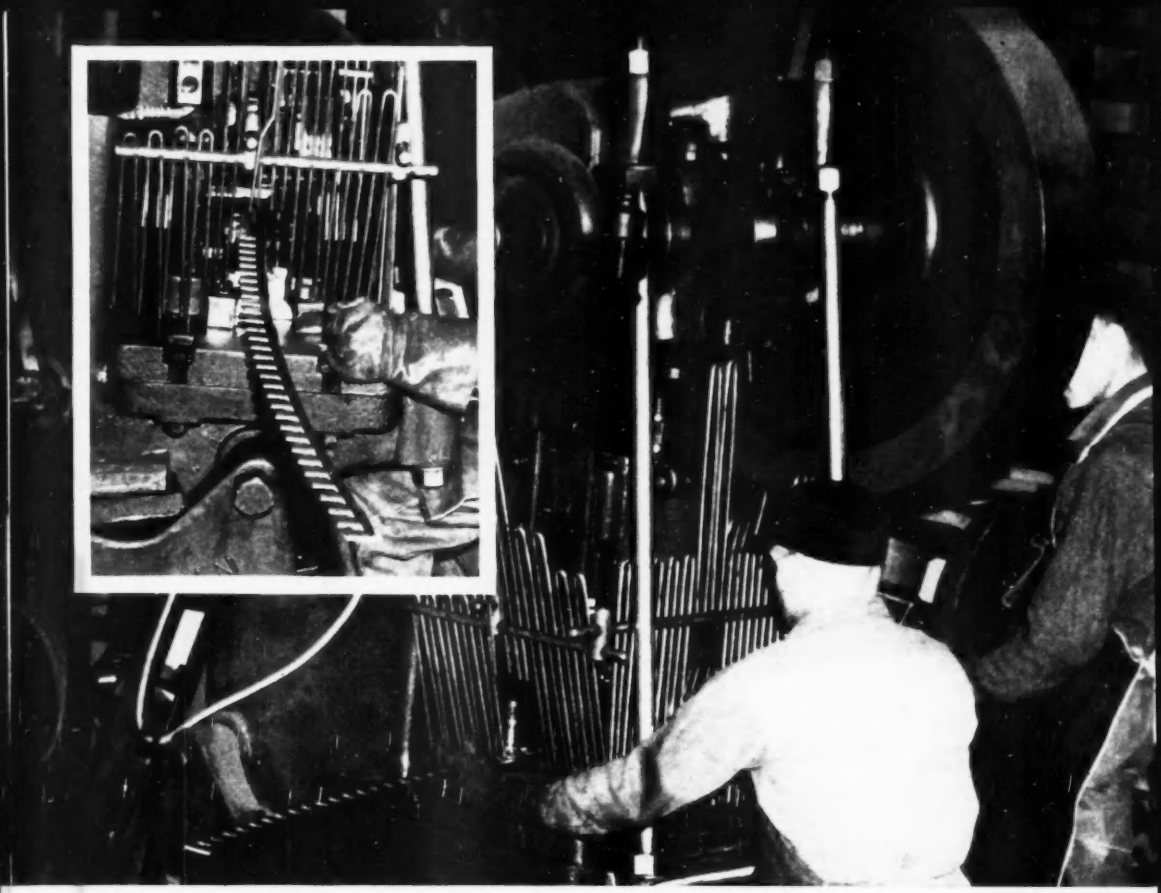
A CHILTON PUBLICATION



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AN UNUSUAL METHOD of making ring gears was adopted by the Gibson Manufacturing Company, Oostburg, Wisconsin. The gears are punched from bar stock of mild, hot-rolled steel in thicknesses of 1/4" and 5/16".

The operation, however, posed certain problems. As a die lubricant, a cutting oil containing lard oil was used. Corners of the punch kept chipping out. Regrinding was necessary at fifteen-hour intervals. Rejections ran 15%. Only 200 pieces could be produced between grinds. Various base oils were tried. Each failed to bring the desired improvements.

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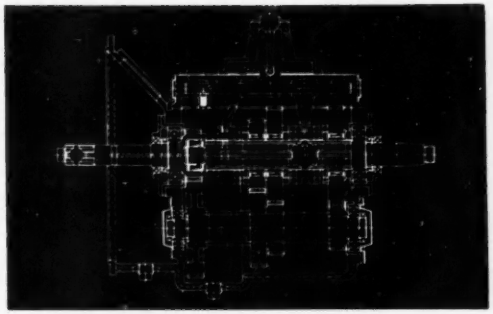
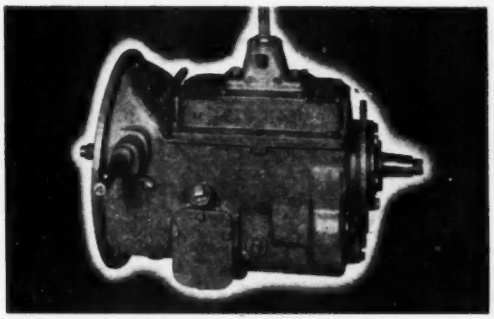
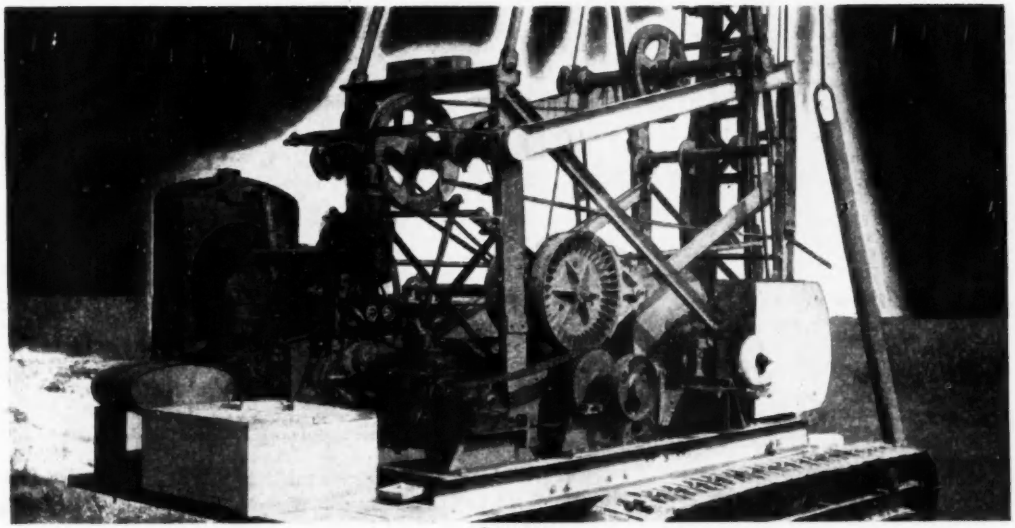


For Keystone Driller: a four-speed heavy-duty transmission, to give continuous trouble-free performance in blast-hole drills. Designed by COTTA engineers for maximum efficiency.



Engineered to order: transmission is constant-mesh, selective-type, with helical gears. Compact unit to fit available space . . . precision-built in every detail. Economical in operation.



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AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

April 1, 1949 Vol. 100, No. 7

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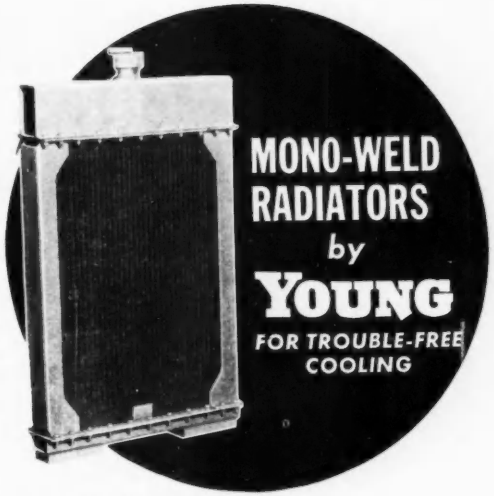

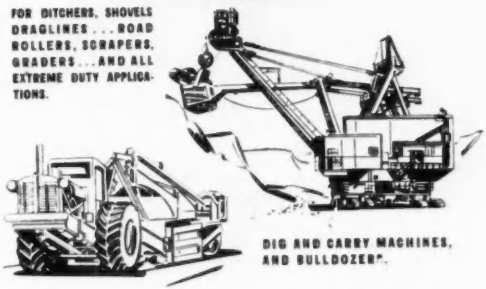
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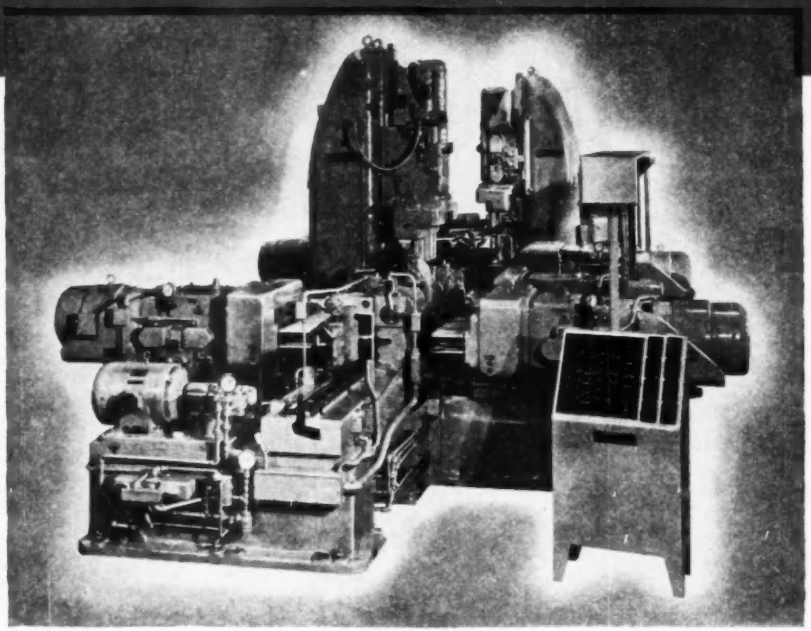

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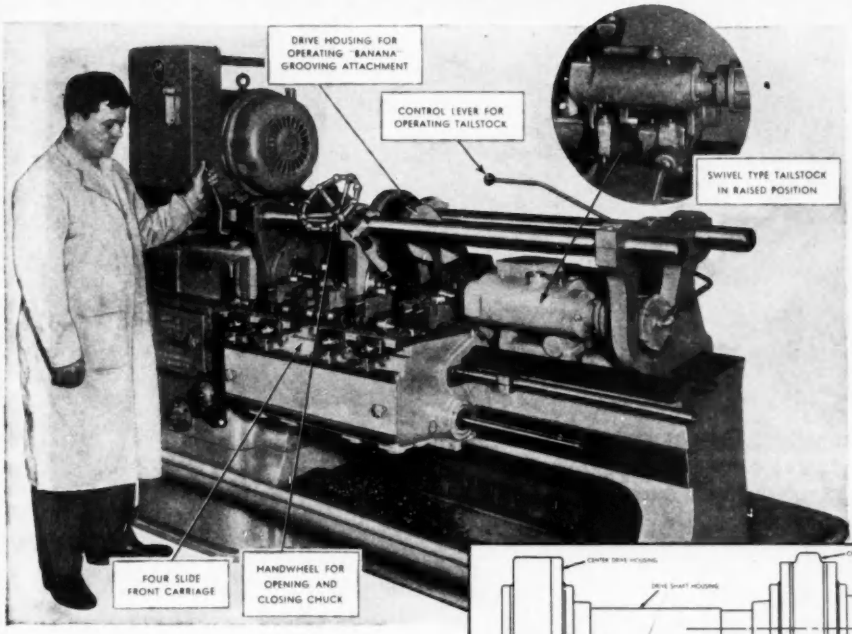
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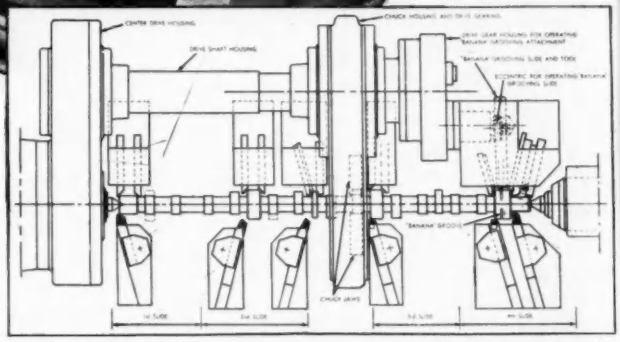

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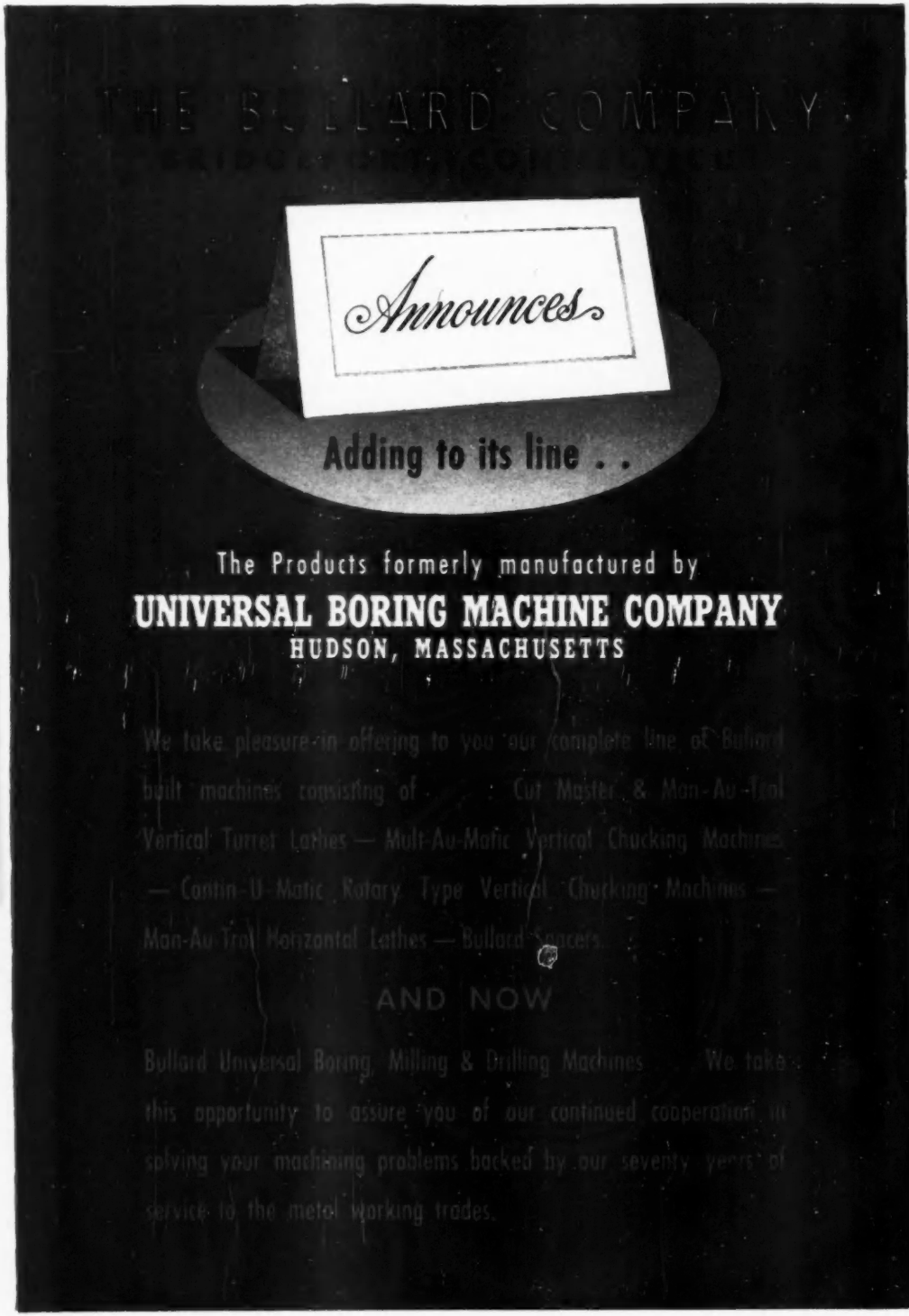
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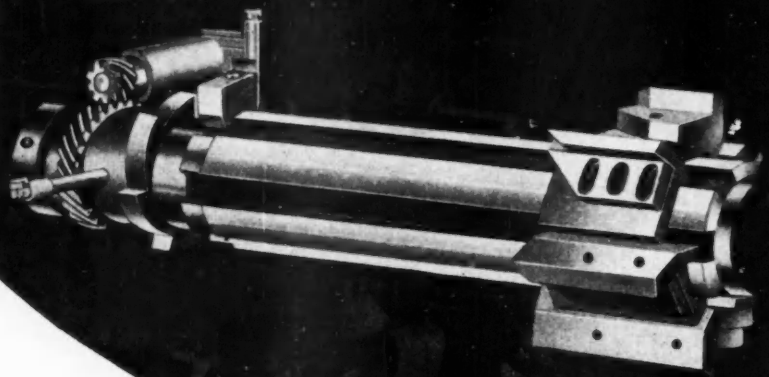

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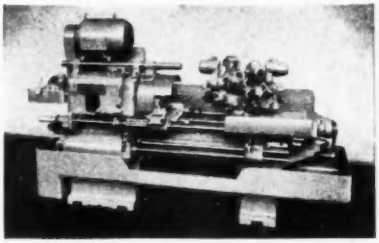

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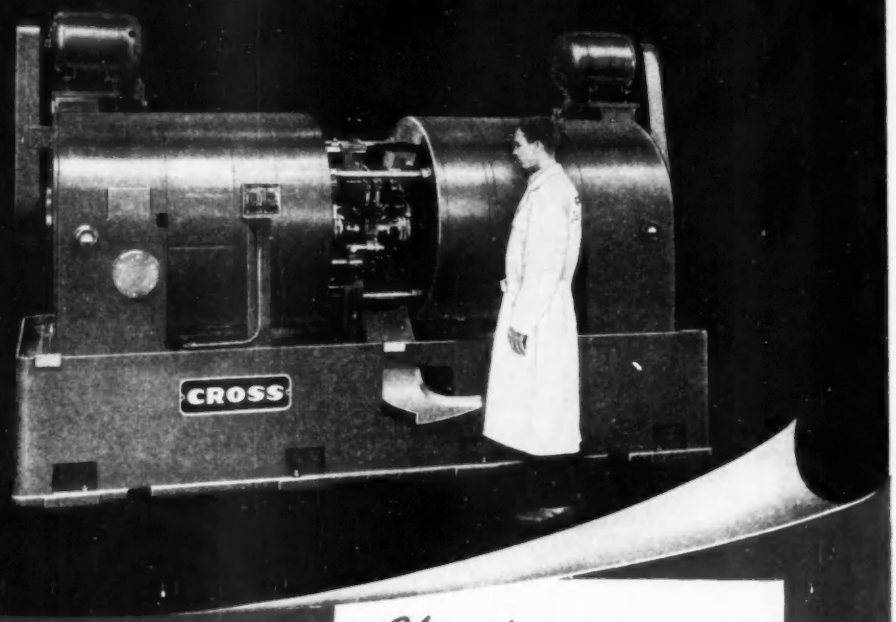

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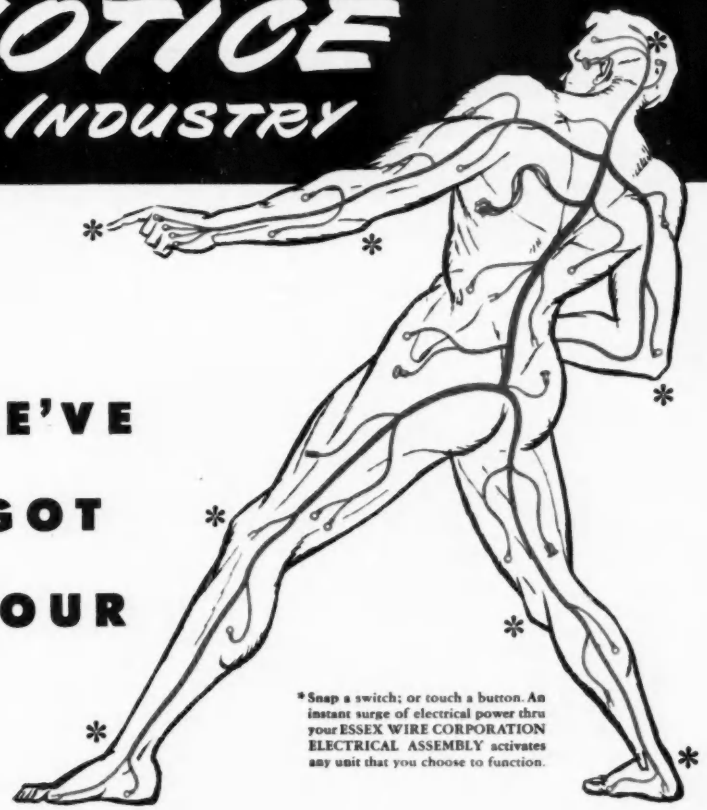

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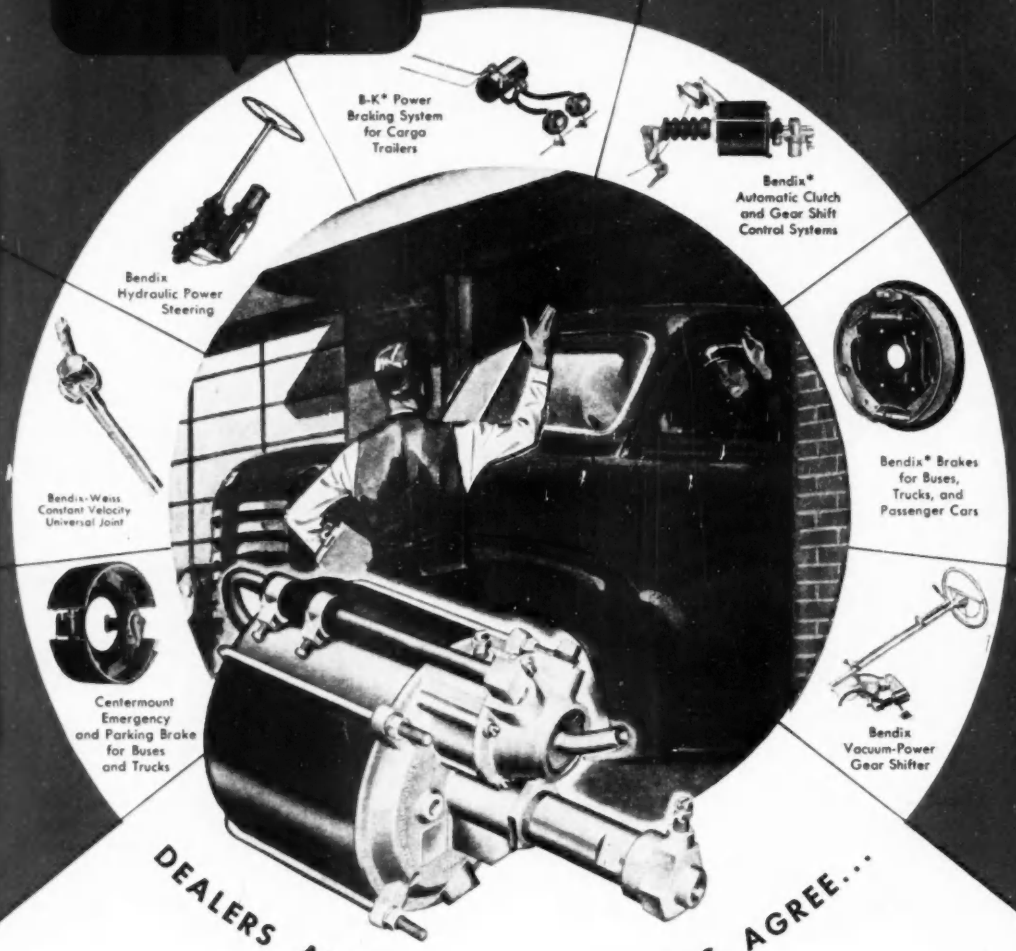
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AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

High Spots of This Issue

Mass Producing Bonded Brake Linings

Two articles in this issue are devoted to important bonded brake lining techniques used on 1949 cars and trucks. The Chevrolet method, detailed in the article starting on page 24, is followed on page 28 by an account concerning the cyclebonding of brake linings at the Chrysler plant.

Offenhauser Midget Racing Engine Improvements

Although basic design of the Offenhauser Midget engine has remained practically unchanged since its 1934 origin, improvements have been made from time to time in valve timing, compression ratios, . . . bearings. This article affords up-to-date 1949 specifications, beginning on page 32.

Tooling For Volume Production of Tractor Components

Detroit Gear Div. of Borg-Warner Corp. is producing transmission, rear axle, and hydraulic pump assemblies for the production program of Harry Ferguson, Inc., manufacturer of small farm tractors. Some of the high precision machinery Detroit Gear Div. is using in producing these assemblies is reviewed in the story starting on page 35.

Supersonic Wind Tunnel Tests to 4000 MPH

North American Aviation's new supersonic wind tunnel of the intermittent-flow type, patterned after the German Kochel tunnel of 1937, operates by air drawn through a vacuum in contrast to the continuous-flow pressure type. Further fascinating facts on this new facility for aircraft testing are found on page 36.

Aircraft Fixtures Adapted to Building Bus Bodies

How thousands of feet of obsolete aircraft fabrication fixtures were cut up, disassembled and reworked into efficient fixtures for bus body assembling at the Twin Coach Co. plants in Kent, Ohio, Buffalo, N. Y., and Canada, is the subject of this illustrated article, page 42.

20 New Product Items And Other High Spots, Such As:

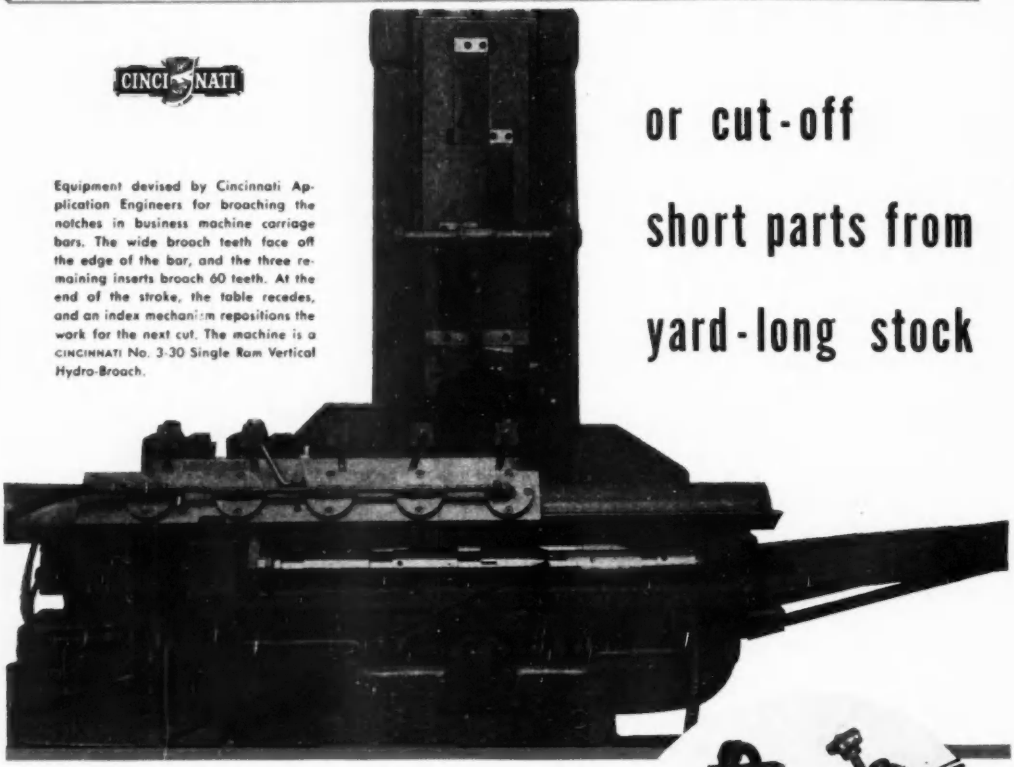
The Snowmobile, Canada's winter vehicle; Measuring piston ring wear to one millionth ounce at the California Research Corp. laboratory; Sparks "Little Six" engine being rebuilt for the 1949 Indianapolis race; and the expectancy that the automobile industries of France and Italy will unite.

News of the Automotive Industries, Page 17

For Complete Table of Contents, See Page 3

HOW TO BROACH PARTS BY THE YARD...

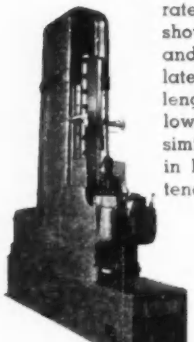
CINCINNATI



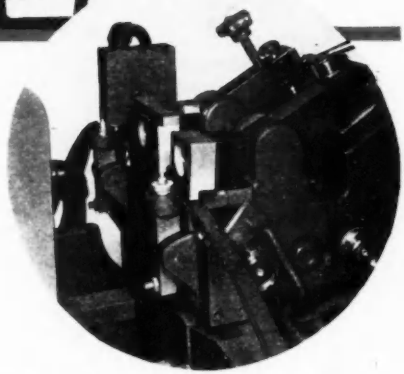
Equipment devised by Cincinnati Application Engineers for broaching the notches in business machine carriage bars. The wide brooch teeth face off the edge of the bar, and the three remaining inserts broach 60 teeth. At the end of the stroke, the table recedes, and an index mechanism repositions the work for the next cut. The machine is a CINCINNATI No. 3-30 Single Ram Vertical Hydro-Broach.

or cut-off short parts from yard-long stock

How long can a broached surface be? On flexible parts, like band saw blades, it can be up to 700 feet long! Rigid parts, like carriage stop bars, have been up to 30 in. long! These long parts are today being broached on CINCINNATI Hydro-Broach Machines, at production rates never before approached. Examples are shown here. The operating cycle is automatic and follows a basic pattern . . . broach, index laterally, broach, and repeat for complete length of part. It offers a new and extremely low cost method of machining notches, teeth or similar contours, evenly or irregularly spaced, in long parts. And the method can be extended still further . . . broaching and cutting off short pieces made from bar stock. Our Application Engineers will help you explore the possibilities. As a starter, send blueprint of part with complete details.



CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach. Specifications may be obtained by writing for catalog M-1389-2.



Close-up of fixture for broaching the teeth in band saw blades, on a CINCINNATI No. 3-30 Single Ram Vertical. The cycle is automatic, and incorporates a shuttling fixture which repositions the work for each downward stroke of the ram. Taking a cut 6 in. wide, 2500 feet of saw teeth are broached per hour.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

NEWS of the AUTOMOTIVE INDUSTRIES

Vol. 100, No. 7 April 1, 1949

GM's 1948 Sales and Earnings Set All-Time High

GM's 1948 operations resulted in an all-time high in sales and earnings. In 1948, net sales were $4,701,770,340 and net income was $440,447,724, while in 1947 net sales totaled $3,815,159,163 and net income was $287,991,373. Unit sales of 2,146,305 cars and trucks produced by GM plants in the United States and Canada in 1948 were exceeded only by a total of 2,369,666 units in the year 1941. Employment in GM reached a peacetime record level of 380,329 during 1948 and payrolls totaled $1,283,865,090, a peacetime high exceeded only in two peak war production years.

Continental to Produce New Engine This Year

Production of aircooled engines for military use by Continental Motors Corp. will get started this year, but will not account for any sizable output, according to C. J. Reese, Continental president. In a report to stockholders, he stated that his company is tooling a large government-owned plant at Muskegon, Mich., at a cost of approximately $9 million for production of the new engines. The $18.8 million contract is on a fixed basis subject to price redetermination. Continental and its subsidiaries reported net earnings of $3,378,123 for 1948, which compares with a net loss of $1,292,874 for 1947.

Car Scrappage Down, Trucks Up in 1948

The reason for the continued high average age of automobiles in this country is evident from scrappage figures released by R. L. Polk & Co., Detroit automotive statisticians. The figures revealed that 855,517, or approximately half the normal number of cars was scrapped last year, indicating that old cars are being kept running longer because of shortage of new cars which existed all through 1948. An entirely different situation exists in the truck field, however, with trucks scrapped totaling 307,867, approximately 60,000 more than any normal year. This, undoubtedly, is due to the high mileage put on trucks during war years, and the fact that the truck industry is in a severe buyers' market in all except the light models. Polk states that since scrappage is virtually the replacement market, the automobile industry's replacement requirements total nearly two million vehicles a year because the prewar average scrappage rate was 1,617,853 passenger cars and 249,602 trucks each year.

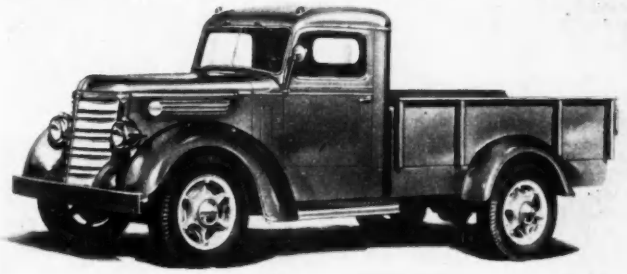
Willys Cuts Prices $25 to $270

Price cuts on its cars and trucks ranging from $25 on the Jeep to $270 on the Jeepster have been announced by Willys-Overland Motors, Inc. The price reductions follow: Jeep, $25; Jeepster, $270; four-cyl station wagon, $150; six-cyl station wagon, $140; six-cyl station sedan, $145; panel delivery, $155; two-wheel drive truck, $130; and four-wheel drive truck, $30.

Other manufacturers made no comment on the Willys price cut, but one spokesman points out that it is very difficult to compare prices of Willys vehicles with cars and trucks made by other companies since they are a more or less specialized product. James D. Mooney, Willys president and board chairman, said price cuts were possible because of four major factors: (1) substantial savings in steel costs, because Willys is not burdened with long-range contracts at high prices nor high cost steel facilities; (2) savings resulting from better supplies of other materials which make possible sustained volume, better stock control, and continuous production; (3) the Willys policy of avoiding annual model changeover, combined with high interchangeability of parts, thus reducing tooling expense and interruption of production; and (4) the functional design of Willys vehicles requiring the use of less material for decorative purposes.

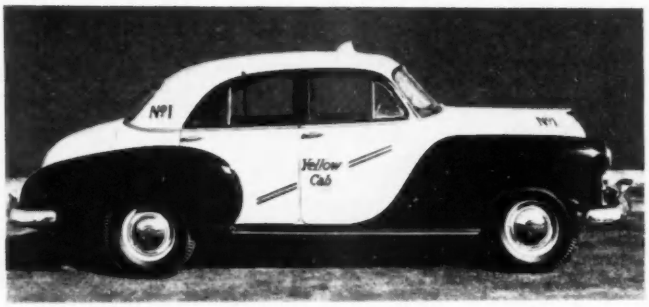
Fisher Body Changeover Fastest in its History

Enabling the five GM car divisions to present their new models with a minimum loss of production time, GM's Fisher Body Div. accomplished the changeover from 1948 to 1949 models in the fastest time in its 40-year history. J. J. Cronin, GM vice-president and general manager of Fisher Body, said that the average shutdown period for all assembly plants was about seven days as compared with the two to six weeks or more considered normal before the war. Fabricating plants as well as



FEDERAL UTILITY

The Federal Motor Truck Co.'s recently-announced Model 15M Utility Express truck (shown above), and Utility Stake truck, both have nine ft. bodies with 135-in. wheelbases, and a nominal rating of ¾ to 2 tons. This model is powered by a six-cyl, 245-cu in. Hercules engine developing 93 hp at 3400 rpm.



ROOMIER FOR RIDERS

This new 1949 Chevrolet taxicab, recently put into service by the Yellow Cab Co., Louisville, Ky., has 30 per cent more glass area than previous models. The entire passenger compartment has been moved forward, lengthened, broadened, and lowered, and 6.70/15 low-pressure tires are standard equipment. This model is equipped with a heavy-duty clutch, 45 per cent larger than the standard unit.

assembly plants made the change in a record period, and Fisher's fabricating plants, located at Detroit, Grand Rapids, Flint and Pontiac, Mich., and at Cleveland and Hamilton, O., accomplished it without closing for a single day—the first time in the companys history this had been done.

GM Insures Supply of Iron and Coke

GM has negotiated an agreement with a Pittsburgh company for a substantial tonnage of pig iron, foundry coke and furnace coke. The deal is reported to involve a five-year contract between GM and the Pittsburgh Coke & Chemical Co. which is expanding its facilities to meet the GM requirements. It is understood that GM will construct 20 of 35 new coke ovens which will be operated by the Pittsburgh concern at the Pittsburgh installation. Delivery is expected to start next September.

A blast furnace with an annual capacity of 750 tons of pig iron has been leased by GM from the Wheeling Steel Corp. GM is said to be reconditioning the furnace, located at Mingo Junction, O., which is expected to be ready by July 1. Wheeling will reportedly operate the furnace for GM.

Auto-Lite's Sales in 1948 Set Company Record

The highest sales in its history were reported by the Electric Auto-Lite Co. and subsidiaries for the year 1948. Totaling $210,070,435, sales for 1948 compare with sales of $185,991,022 for the preceding year, while 1948 net earnings amounted to $12,196,493 as against $10,714,987 for 1947. Royce G. Martin, president and chairman of the board, said that the company has spent $43,156,820 since the war in plant expansion and modernization, and has more than doubled its manufacturing area until it now totals more than 9 million sq ft. Mr. Martin disclosed further that the new facilities at Lockland, O., will be used for the production and plating of all types of automotive lamps and zinc die castings, and for the complete fabrication of automotive fuel pumps, a new Auto-Lite product. The entire expansion and modernization program, on which $19,028,238 was spent in 1948, is expected to be completed in 1949. This includes a new wire and cable plant under construction at Hazleton, Pa., and a new battery plant being built at Paramount, Calif.

Ford Appoints Yntema To Finance Post

Theodore O. Yntema, consulting economist and a professor at the University of Chicago, has been appointed vice-president-finance of the Ford Motor Co. and a member of the policy committee. He succeeds Lewis D. Crusoe, who was made general manager of the new Ford Div. when it was formed recently.

Ship Over 4.2 Million Tires in January

Manufacturers' shipments of passenger casings for the month of January, 1949 totaled 4,249,036 casings, a decline of 1.65 per cent from December when the shipments totaled 4,320,195, the Rubber Manufacturers Association, Inc., reported recently. The produc-

Acme

TONIC FOR TOTS

Going into operation recently in Blackpool, England, this new ambulance is said to be first of its kind decorated inside and outside with Disney characters for children. It reportedly is tending to alleviate most of the terror that trips to the hospital have for youngsters.

tion of passenger casings rose to 4,772,116 casings, against 4,609,669 the previous month. Shipments of truck and bus casings in January were down to 1,036,367 units from 1,122,331 in December. Production was up to 1,123,820 casings, compared with 1,105,386 the month before. Shipments of automotive tubes during the month of January rose to 4,925,547 units against 4,722,364 in December. Production was about even with the previous month at 5,062,357 units.

International Harvester Forms Finance Subsidiary

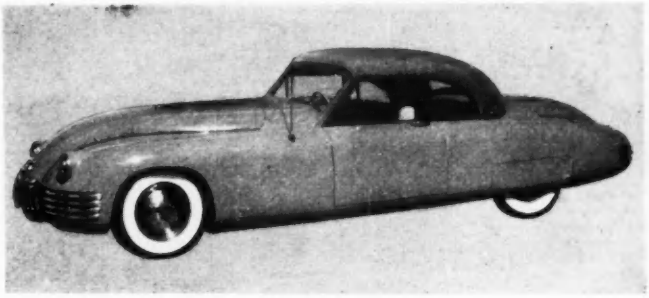
The International Harvester Co. has announced the organization of a finance company as a wholly-owned subsidiary. Named the International Harvester Credit Corp, and expected to be ready for business by April 26, the credit corporation's purpose will be to finance domestic notes receivable of International Harvester for which there is no other source of financing available. Emphasizing that banks and other financial agencies will continue to be the main source for financing of the company's time sales, International said that the recent growth of credit sales indicates the need for new credit financing to supplement the financing of its sales.

Del Mar, New Four-Cyl Car, to be Built in San Diego

A new four-cyl car, the Del Mar, has been announced for mid-summer production by Del Mar Motors Inc., San Diego. This car has a 63-hp Continental engine, and a 100 in. wheelbase. Its speed is claimed to be up to 80 mph. Del Mar Motors is producing this passenger car in three models: de luxe convertible, business coupe, two-door sedan, and the announced price is $1170, fob, San Diego.

Crosley to Complete Building in Marion, Ind., by May 1

May 1st has been set by V. P. Birtley, Crosley Motors plant manager at Marion, Ind., as a tentative date for the completion of the new 352 by 60-ft steel frame plant building at the Marion works of the company. All of the steelwork is in place. New presses and other equipment for the production of parts now obtained from outside sources will be installed in the new building, which is constructed so as to permit adding another 60 ft to its width when needed in the future, according to Mr. Birtley. He also reported that current Crosley car production at the Marion plant now averages approximately 100 units daily.



KUSTOM-BUILT BY KURTIS

Exhibited at the recent Hot Rod Exposition in Los Angeles, Frank Kurtis' custom built car, shown here, is built on a 1941 Buick Roadmaster chassis. The chassis changes include the removal of the X member and boxing of frame rails. Featuring aluminum body panels, the car weighs under 4000 lb. The removable top is of steel framework with aluminum skin which is cloth covered.

No ASI Show in 1949— To Resume in 1950

The Motor & Equipment Manufacturers Association, the Motor & Equipment Wholesalers Association, and the National Standard Parts Association have announced that they have agreed in view of majority manufacturer and wholesaler opinion there will be no Automotive Service Industries Show in 1949, and that the ASI Show will be resumed in 1950.

Reo Motors Earnings Drop Sharply in '48

Reo Motors, Inc., reports a very sharp drop in net earnings last year compared with 1947. Net profit in 1948 was $110,068 on net sales of more than $38 million, compared with net earnings of $4,894,454 on total sales of more than $57 million the preceding year. J. S. Sherer, Jr., Reo president, told stockholders that 1948 was a difficult year for Reo with the company entering a "very definite" buyers' market in the truck field. He added, however, that equipment and tooling have been purchased for the production of a new valve-in-head truck engine which has been under development for several years, and that the new power plant will put the company in an excellent position to attain a large share of the truck market.

B. D. Kunkle Retires From GM

Bayard D. Kunkle has retired from GM. He was a member of the board of directors, and was also vice-president in charge of overseas and Canadian operations. He joined GM in 1925 and served with the Remy Electric Co., Delco Remy and Frigidaire. In 1934, he was made assistant to C. E. Wilson, then vice-president of GM, and was elected to the board of directors in June, 1948.

Auto-Lite Opens New Plant for Die-Casting

The Electric Auto-Lite Co. has increased its die-casting production facilities with the opening of its new plant in Lockland, Ohio. In addition, Auto-Lite's Woodstock, Ill., plant has been enlarged, further increasing die-casting facilities. A portion of the more than 4.5 million sq ft contained in the former Wright Aeronautical plant, bought last year by Auto-Lite, has been devoted to the production of zinc die castings.

Army Trucks Back at Aberdeen After Temperature Tests

The Ordnance Dept. has announced the return of 14 Army test trucks to the Aberdeen Proving Ground. These 2½-ton vehicles left Aberdeen last August on a 20,000 mi test run in order to test six new all-weather automotive greases. The vehicles traveled through 20 states and Alaska so that extremes in temperatures and other driving condi-

European

BIG WHEEL

Tested recently in a race in Paris, the Motorail, shown here, is the invention of a Mr. Grader, a Swiss engineer. The Motorail is said to have a speed of approximately 125 mph.

tions would be encountered. Ordnance officials told AUTOMOTIVE INDUSTRIES that the fact that all vehicles returned without being involved in a single mishap and without changing grease is an indication that the new products have partially proven their worth. The vehicles are now being torn down and the greases will be subjected to exhaustive tests of all types. However, it will be several months before a report is available. Ordnance hopes that these all-weather greases will eliminate the 30-hr period required to convert vehicles for cold weather operation.

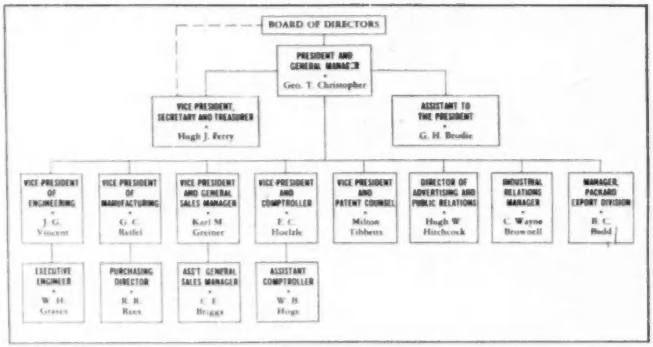
GM Wins Safety Award for Fifth Time

GM was recently honored as the first U. S. industrial organization to win for the fifth time the National Safety Council's award of honor for distinguished service to safety.

Ned H. Dearborn, president, National Safety Council, presented the award to H. H. Curtice, GM executive vice-president, and in making the award, Mr. Dearborn pointed out that GM had previously won the council's award of honor for 1942, 1943, 1944 and 1947. GM's company-wide accident frequency rate in 1948 (number of accidents per million man hours worked) was 3.16, an improvement of 25 per cent over the 1947 record.

Packard's 1948 Earnings Topped $15 Million

The Packard Motor Car Co. entered 1949, its Golden Anniversary year, in the best financial condition of its history, according to George T. Christopher, president and general manager. For the year 1948, Packard reported consolidated net earnings of $15,109,439 as compared with net income of $1,100,691 for 1947.



PACKARD'S TOP TEAM

The 15 major executives in this Packard Motor Car Co. organization chart average 56 years of age, 28 years of Packard service, and 33 years of automobile experience. Packard states that mainly through realignment of responsibilities and operational procedures, organizational streamlining has been accomplished during the past few months.

American Body Engineers Elect Officers and Trustees

At the recently-held annual meeting of the American Society of Body Engineers, the following officers and trustees were elected for the coming year: president, Arthur L. Bradley, chief engineer, Wettlaufer Mfg. Co., Detroit; vice president, Carl W. Cenzer, body development engineer, Hudson Motor Car Co.; secretary, Harold V. Atnip, asst. chief body draftsman, Chrysler Corp.; treasurer, William K. Norwick, exec. asst. of gen. director engineering div., Fisher Body Div., General Motors Corp.; trustees, I. Louis Carron, Carron Co.; Alfred H. Haberstump, Haberstump Harris Co.; Harry G. Garman, Fisher Body Div., General Motors Corp.; Lynn A. Fill, Motor Products Corp.; Roy F. Anderson, Briggs Mfg. Co.; Harvey J. Anschuetz, Kaiser-Frazer Corp.; Albert W. Arndt, Chrysler Corp.

Price New Reo Speed Wagon at $1798

A factory list price of $1798 has been announced for the new Reo Speed Wagon express truck. The body as well as the chassis is covered by this price, which excludes state and local taxes.

Business Census to Cover Automotive Trade

This year the Dept. of Commerce's Bureau of the Census will enumerate motor vehicle dealers and related businesses among the three million business establishments of the U. S. About 4500 enumerators will call on all wholesale, retail, and service establishments for statistical information covering their 1948 operations. This data will, it is said, generally fit the chassis of the last previous business census conducted in 1940 covering operations in 1939. In addition to measuring motor vehicles distribution in terms of number of establishments, dollar sales, number of passenger cars and trucks sold (new and used), employment, salaries and wages, etc., this

census will also assemble information on the use of motor vehicles by retailers, wholesalers and certain classes of service establishments. Moreover, the extent of expansion between 1939 and 1948 in the automotive service and repair trades will be determined.

GM Detroit Show to be Bigger than NYC Exposition

GM says that its Transportation Unlimited exposition scheduled for Detroit, April 10-17, will be bigger and better than its New York show. Over 50 mechanized exhibits and 55 1949 model automobiles are going to highlight the Detroit display, which will include a new GMC 55-passenger city coach. From GM's Electro-Motive Div. will come a complete Diesel locomotive cab assembly.

Cox Made Consultant to Crosley Motors

Arthur Cox has been appointed technical consultant in body design for Crosley Motors, Inc. He had formerly been associated with the Hayes Manufacturing Corp., Murray Corp., and Kaiser-Frazer.

Batt Heads Committee to Foster World Trade

To further public understanding of the urgent need for freer world trade, and to bring about U. S. participation in the International Trade Organization, a national committee has been formed under the chairmanship of William L. Batt, president, SKF Industries, Inc. The committee's operations will be directed by Charles R. Weaver, Studebaker Export Corp., South Bend, Ind., as executive assistant, and members of the committee, representing all sections of the country, are to be named in the near future.

Ford International, Inc. Names Vice Presidents

The Ford Motor Co. has announced the appointment of two vice-presidents of Ford International, Inc., newly formed wholly-owned Ford subsidiary. A. C. Moore has been made vice-president-manufacturing. He resigned as factory manager of Chrysler Corp.'s Plymouth Div. to take the post. Harold E. Jones, formerly assistant director of supply for Ford International Div., has been made vice-president-supply.

Permit More Natural Rubber In Inner Tubes

As the result of an amendment of Allocation Order R-1, issued by the Dept. of Commerce, inner-tube manufacturers may now use more natural rubber in the production of popular-size tubes. The change permits a manufacturer to make 40 per cent of his 9.00 cross-section and smaller tubes of natural rubber. The remaining 60 per cent must be manufactured from butyl. Previously, 80 per cent of a producer's output of popular-size passenger car and small bus and truck tubes had to be made of butyl.

Hydraulic Press Appoints Vederko Works Manager

Hydraulic Press Mfg. Co. has announced the appointment of J. P. Vederko as works manager. He succeeds E. J. McSweeney who has resigned as vice-president in charge of manufacturing. Mr. Vederko was formerly general superintendent of the Cross Co., Detroit, and has also been associated with the Ex-Cell-O Corp.

Steel Supply Continues To Show Improvement

The outlook for steel improves week by week. Since the first of the year, there has been a noticeable pickup in optimism on the part of automobile manufacturers concerning the availability of steel. This is being reflected in increased schedules particularly by the Big Three and also by Studebaker among the independents. Further evidence of the improved steel supply is a report that at least four companies doing business in the Detroit area are now offering bonus shipments of steel.

New Ford Motor Parts Depot In Richmond, Calif.

Serving 500 Ford dealers in six far western states, a new parts depot at Richmond, Calif. has been announced by the Ford Motor Co., according to Earl G. Ward, Ford Div. parts and accessories manager. Handling about 15,000 different parts, the new depot has 136,800 sq ft of warehouse space and 11,500 sq ft of office space. It will also handle parts for Lincoln-Mercury dealers in the far western states.

UAW-CIO Report Shows Large Strike Fund

According to the latest financial report of the UAW-CIO, the union now has more than $984,000 in its strike fund. At the end of February, liquid assets of the union were in excess of $2.3 million, and membership totaled approximately one million. The report states further that in the November, 1948-February, 1949 period, money paid out for strike relief represented a low point of $53,842, and in February the total of about $7000 was the lowest in the past year.

Hudson Doubles Net in 1948

Doubling its consolidated net income in 1948, the Hudson Motor Car Co. has

MOBILE DOUBLE

The new Kaiser Traveler can double as a six-passenger sedan or light truck or station wagon. With the rear seat in folded position, it can provide 85 cu ft of carrying space. The back is hinged top and bottom—the upper deck is hinged in the roof above the rear window. This model is priced at $2088, plus local taxes and transportation.

FAST MOVING SABRE

The North American F-86 Sabre, shown above, said to be the U. S. Air Force's fastest jet fighter has a sweep-back of 35 deg for both wing and tail assembly. Powered by a GE J-47 turbo-jet engine, the F-86 set the world's speed record at 670.981 mph at Muroc, Calif. last September.

stated that its 1948 earnings totaled $13,225,923 as contrasted with $5,763,-352 in 1947. Net sales in 1948 amounted to $274,728,638 as against $159,514,-329 in 1947. In 1948, Hudson shipped 142,454 cars, 38 per cent more than were shipped the preceding year.

Tucker Engine Subsidiary Continues Production

Trustees for the Tucker Corp. have announced that the air-cooled engine plant at Syracuse, N. Y., owned by the company will be kept in full operation. They report that the plant last year earned a net profit of more than $400,-000, and that it will continue to operate at the maximum possible rate of engine production.

To Make New Midget Car in Los Angeles

A new car is scheduled to come out of the West Coast before summer. It is expected to fill the place between the scooter and the automobile. Two models are planned for this two-passenger car, a sleek plastic Sportster, priced at under $750, and a utility Townecar, priced at $475, fob, Los Angeles. With 72-in. wheelbases these models are to be powered by a 12-hp rear engine.

Willys Names Benning Chief Engineer

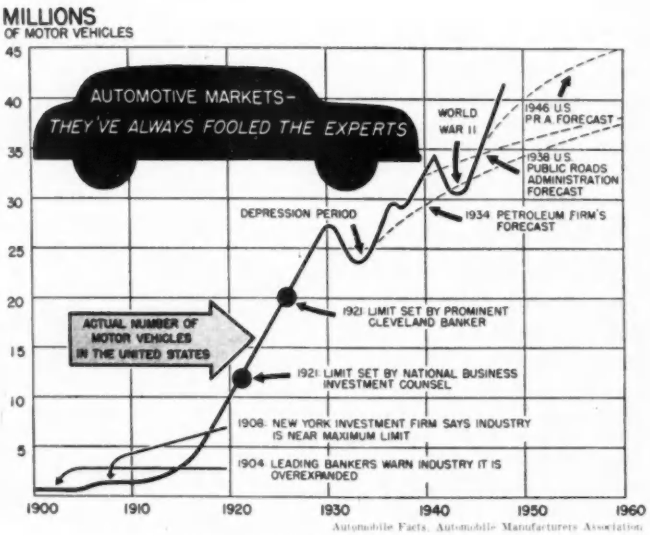
Walter F. Benning has been appointed chief engineer of Willys-Overland Motors. He has been technical assistant to the vice-president in charge of engineering for the past two years. Willys has also announced the appointment of Philip C. Johnson as assistant chief engineer. He has been assistant to the vice-president in charge of engineering for the past four years. Before joining Willys in 1937, he was body experimental engineer for Hudson.

Studebaker 1948 Net Double 1947 Level

Net profit of the Studebaker Corp. for the year ended last Dec. 31 was $19,114,972, representing 4.98 per cent of sales. Profit was more than twice as great as the company earned in 1947. Working capital at the end of last year amounted to more than $39 million, an increase of more than $4 million over the previous year.

Power Steering for Cars Under Development

Not much has been heard lately about power steering for passenger cars, but a hint dropped by one speaker at the recent SAE meeting in Detroit indicated that the subject is being explored. The speaker said that at least two companies have under development power steering units which they are testing for possible passenger car application.



THE PERILS OF PREDICTION

That the automobile industry continues to confound the experts is clearly shown in this chart contrasting various forecasts of registration against actual motor vehicles in use. Since 1904 when the industry produced 23,000 vehicles when the country's leading financial experts warned that it was overexpanded to the estimate in 1946 by the U. S. Public Roads Administration that 39 million vehicles would be in use by 1950, as against 41 million cars, trucks, and buses actually in use in the country today, the automobile industry has continually outstripped the experts' estimates.

NEWS *of the* AUTOMOTIVE INDUSTRIES

British Automobile Trade Group Sets Up Washington Office

To assist British automobile manufacturers in opening and developing the North American market, the Society of Motor Manufacturers and Traders, British automobile trade association, has opened offices in Washington, D. C., and Ottawa, Canada, to be headed by Sir William Welsh.

Czechs Develop Turbine Automobile

A new 60-to-80 hp turbine motor car has been developed in Czechoslovakia, according to the Dept. of Commerce. Naptha, coal gas, hydrogen, acetylene, butane mixtures, gasoline, and other combustible gases may be used as fuel.

Contract to North American for Atomic Research

A contract has been awarded to North American Aviation, Inc. for nuclear reactor technology research and development, with emphasis on the investigation of materials and components suitable for the practical application of atomic energy, according to the U.S. Atomic Energy Commission.

1949 Westinghouse Tool Forum In Buffalo, April 26-27

The 1949 Westinghouse Machine Tool Electrification Forum will be held April 26-27 in Buffalo, N. Y.

Army

WHOOOSH!

The spectacular take-off of this USAF North American B-45 jet bomber is made possible by two Jet Assisted Take-Off (JATO) units, each developing 4000 lb static thrust, under each wing, added to the 20,000 lb of static thrust developed by four GE TG-190 jet engines.

Bullard Co. of Bridgeport Gets Universal Boring Machine

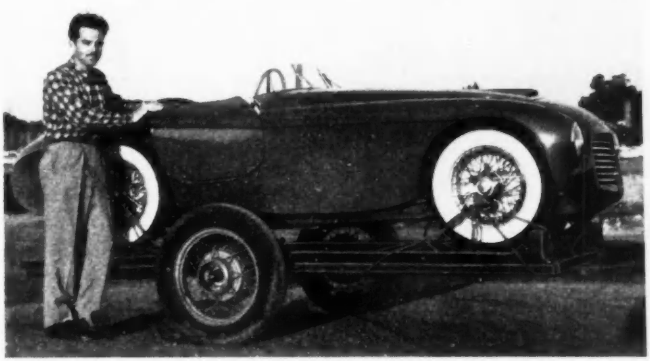
The Bullard Co., Bridgeport, Conn., has acquired the business and products of the Universal Boring Machine Co., of Hudson, Mass.

Don Lee Gets Wrong Ferrari for Indianapolis Race

The 12-cyl, 122-cu in. Ferrari which was ordered by Don Lee and which recently arrived in the United States will not run in this year's Indianapolis race. As shown in the illustration, it has an Amelia Meglia body, which is a type used for 1000-mi races on the Continent, and is not the car which Mr. Lee expected. Its body is too large, and time will not permit the building of a suitable body to enter in the race next month. The Ferrari is a limited production car, with engines of different compression ratios and timing according to whether it is used for fast passenger service, long distance trials or speed events. The car received at Los Angeles is similar to the one with which Chinetti last year won the 12-hr race on the road track at Montlhery, near Paris, at 72.5 mph and the 100-mi class record at 126.4 mph.

The twelve cylinders are a single light-alloy casting, with cast iron liners, the cylinder barrels are at 60 deg, and the bore and stroke are 2.362 by 2.311 in. Separate light-alloy heads are used, with a single camshaft for each bank of cylinders, the valves being inclined in the hemispherical combustion chamber. The counterweighted crankshaft is carried in seven main bearings. Pressure lubrication is of the dry sump type with an oil radiator. Light alloys are used for the oil pan, timing gear housing, valve cover, oil radiator, etc. Two magnetos are mounted at the rear of the engine, each supplying spark to six cylinders. On the racing car there are three downdraft carburetors set in the angle formed by the two banks of cylinders and having a common air passage, with a scoop on the forward edge of the hood. On the supercharged job, the Rootes type blower is mounted at the front, with a straight three-branch intake manifold set in the angle between the cylinder banks. The car-

(*Turn to page 60, please*)



TOO LATE FOR INDIANAPOLIS

This is Don Lee's new Ferrari which recently arrived in Los Angeles. It is not the model he expected and will not be raced at Indianapolis this year. Shown with the car is Mack Hellings who will drive the Offenhauser-powered Don Lee special, his only entry in the Indianapolis race.

The Chevrolet Method

Mass

By Joseph Geschelin

TWO MILLION bonded brake shoe and lining assemblies in the field on Chevrolet ½, ¾, and one-ton trucks, following a period of over a year of actual production experience has led to the adoption of bonded brake linings on 1949 Chevrolet cars. To meet this heavy demand the company has set up self-contained brake lines of continuous type capable of producing bonded shoe and lining assemblies at the rate of 3200 to 4000 pieces an hour to cover production and service requirements. The initial phases of this development go back as far as 1939, followed by years of experimentation and road testing. Because of the close control required at each step of the process, Chevrolet has established as a basic service policy that lining replacement in the field will be handled exclusively on an exchange basis.

In its essential elements the Chevrolet brake assembly remains the same and employs the same type of molded brake lining used heretofore, except that neither shoes nor linings are drilled for rivets. On the other hand the bonding process introduces the application of bonding tape together with techniques for securely cementing the lining to the shoe. Many process controls are exercised at every step, with certain 100 per cent inspection routines added to give complete assurance of perfection of bonding.

In production the process begins with conveyorized flow of linings and brake shoes — on separate courses —for the proper preparation of the surfaces to be bonded. Linings are fed into the magazine of an automatic spray machine where the inner surface of the lining is coated with a suitable primer. This penetrates the entire contact area and provides a compatible surface for bonding later on. The primer is air-dried on the conveyor while in transit.

Closeup of one of the pressure band assemblies, showing a pair of shoes and linings held under pressure, ready for baking.

At the same time brake shoes are moved on a conveyor to an elevator which carries the parts to a penthouse on the roof for varnishing. Here the shoes move continuously through a process line running about 110 ft for chemical cleaning and varnish dip. The work is moved successively through a wash, hot rinse, acid bath, hot rinse, and varnish dip. The last stage in this line is passage through an oven, the function of which is to thoroughly dry the varnish before handling. The brake shoes then return to the assembly floor from the roof on the same conveyor.

The next basic step is the attachment of the bonding tape to the lining. As illustrated, the tape is handled in large rolls, the roll being mounted on a reel at the end of the machine. As the tape feeds through, it is automatically stripped from its paper backing, cut to length, and rolled into the lining concavity with moderate pressure. The previously primed coated surface serves to hold the tape securely while the lining moves through succeeding steps.

The scene now shifts to the assembly line conveyor immediately adjacent to the equipment mentioned above. The function of this assembly line is to prepare sets of shoes and linings for bonding. Immediately in front of the operators is a feeder monorail conveyor carrying the prepared brake shoes, pressure bands to hold the assembly for bonding, springs, and bushings. The first operation is to set the pressure band in the fixture, followed by the installation of a pair of shoes and linings. Farther along this line operators install the pressure springs in the center of the assembly, and insert a special locating pin or "needle" as they call it. The bushing, which later serves to separate the springs, next is mounted over the top of the needle. Near the end of the line, there is a suspended hydraulic ram which, in one operation, presses out the needle and simultaneously presses the bushing home so as to expand the two springs and thus hold the shoes and linings against the band under pressure. They are now ready for baking.

The sub-assemblies move along on the table-height conveyor to the furnace elevator where they are laid on carriers for transport to the baking oven in the penthouse. The elevator has a station on each side. On one side the work is loaded for transport to the oven while on the other side the work is removed for final steps preceding assembly.

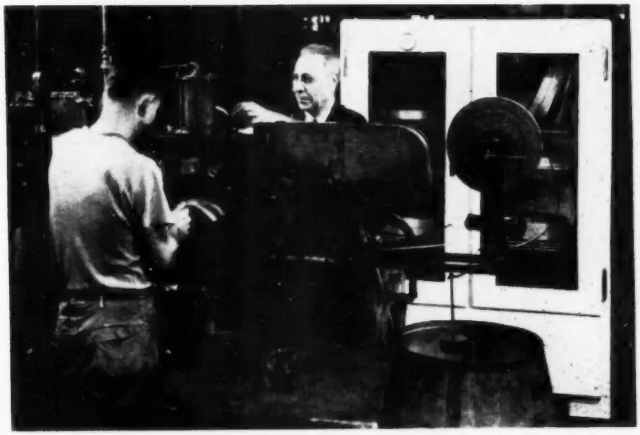
To conserve valuable floor space the baking oven has

Here is a view of the assembly conveyor where brake shoes (already varnished) and brake linings with bonding tape attached are assembled in a pressure band.

Production of Bonded Brake Linings

Presented Here Are Informative Descriptions of Chevrolet and Chrysler Methods, the Former Starting on the Facing Page, the Latter on Page 28.

been installed in a penthouse on the roof. The oven is about 87 ft long, and has a closely controlled heating cycle. The temperature gradient has a slow rise along the length of the oven to the maximum temperature of 400 F which is maintained for the last 12 minutes of the 56-minute baking cycle. After leaving the oven the work is air-cooled



At the right is the coil of banding tape which is automatically separated from its protective paper coating while being fed onto the lining. The refrigerator, holding a day's supply of banding tape, may be seen in the background.

during transport to the unloading station on the assembly floor. The complete cycle, floor-to-floor from the time work is loaded on the elevator to the time it is unloaded at the station on the opposite side of the elevator is two hr, 45 min.

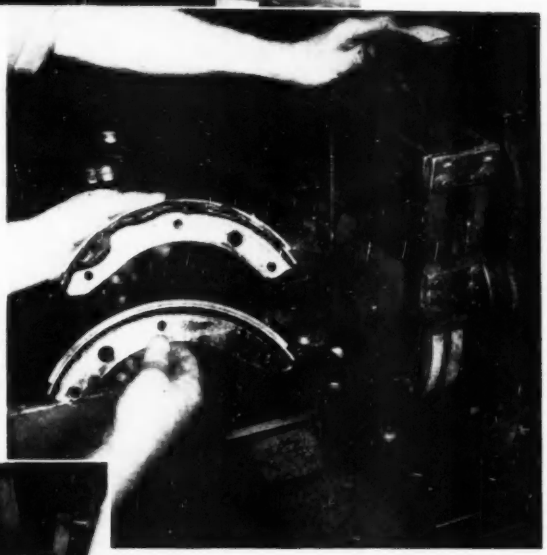
At the unloading station the center bushing and springs are knocked out for removal of the brake shoe assemblies. At this stage the excess bonding material found on the edges of the lining is removed in a simple machine which cuts off the excess on both sides.

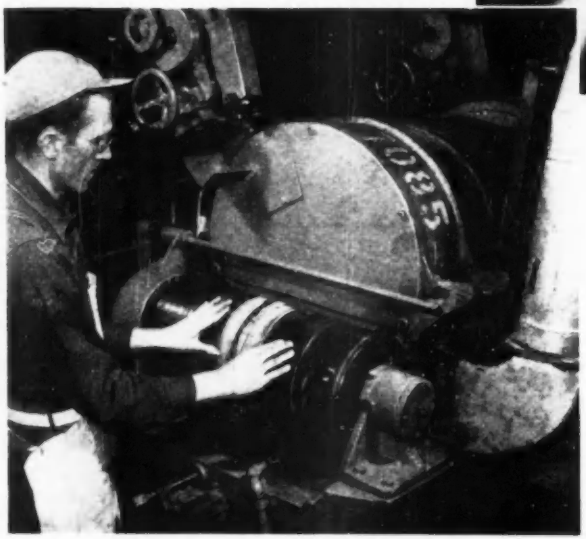
Next follow important quality control operations. First of all each bonded lining is subjected to a shear test in a special testing machine, the lining being edge loaded to 4000 lb. All linings must withstand this severe test without showing signs of failure.

This is followed by a full-load test to destruction of a sample of one piece out of each lot of 1000. Here the lining is loaded hydraulically until failure occurs. The shear load runs between 12,000 and 15,000 lb on the average. It is of interest that in all cases, this test has sheared the lining only, the bond being intact in all instances.

Accepted shoe and lining assemblies then go to the grinder for surface grinding the

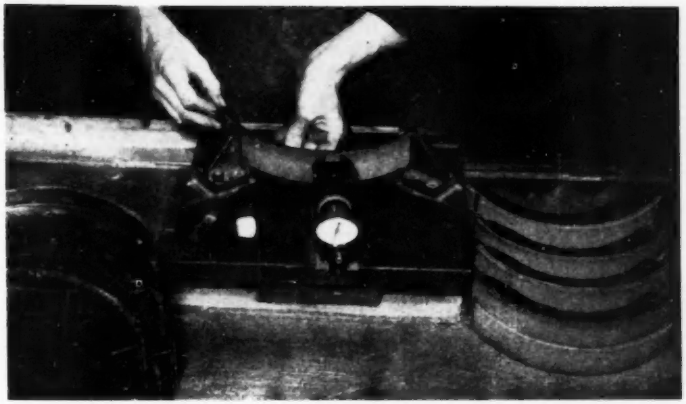
View of loading station of the elevator on which the pressure band assemblies are transported to the baking oven on the roof. As shown, the parts come in on the chute at the left and are transferred to the carriers by an operator.





Upon returning from the baking operation the linings usually have a "flash" of excess bonding material on the sides. Shoes go into the machine shown here for removal of flash.

Following removal of flash the bonded shoes go to the special grinding machine seen here for grinding the OD to a true curvature and in accurate alignment with anchor pin holes in the shoes.



Upon completion of grinding of the OD each shoe is inspected in the fixture shown here to assure dimensional accuracy.

noted that the tape itself is held to close tolerances so far as dimensions are concerned in order to control the volume of active material. Width is held to a tolerance of plus or minus 1/16 in. while thickness is held to a total tolerance of 0.003 in.

Bonded Brake Linings

lining braking surface. This is a fussy operation since the face of the lining must be held parallel with the anchor pin hole in the shoe while the distance from the center of the hole to the outer surface of the lining is held within 0.002 in. For this operation, the linings are fitted in pairs into a drum fixture and revolved while contacting the face of the big wheel. Following this operation the shoes are ready for delivery to the final brake assembly line.

The bonding tape is a vital element of the process. In the first place, the bonding material finally adopted by Chevrolet is of phenolic resin type supplied in the form of a thin tape in rolls. Since it is an unstable material, aging at room temperatures, it requires special handling and extreme care. To assure stability the material must be kept at a temperature of 40 F.

Accordingly, the company has built a special refrigerated storage building of sufficient capacity to hold at least a month's supply of tape. For production use, they have a refrigerator at each of the three production lines, capable of holding a day's supply of tape for each line. These cabinets hold the tape at 40 F.

Because of these requirements the size of a roll of tape as well as the speed of the production process must be so balanced as to prevent the exposure of tape in uncured form to room temperatures for periods exceeding one hour. Consequently, the speed of the process described above is such that not more than an hour elapses from the time a roll of tape is installed in the machine to the time linings containing the tape are on their way to the baking oven. Finally it may be

On the pages immediately following is a full description of Cyclebonding Brake Linings at the Chrysler Plant

This is the destructive testing arrangement in which linings are subjected to edge loading as high as 16,000 lb to destruction. As mentioned in the text, this is done on a sampling basis—one shoe out of each lot of 1000.

First operation on linings is wire brushing of the concave surface in preparation for applying Cycleband cement. This is done automatically in one of a battery of special machines as illustrated. Linings are fed into the magazines, as shown, and are pulled through by means of the rollers in the foreground. The wire brushes may be seen directly above the second set of rollers.

Chrysler Corp. Cyclebonding

FOR its 1949 models Chrysler Corp. has adopted a unique technique of bonding brake linings to brake shoes, thus discarding the previous practice of riveting. Cycle bonding, as this technique is called, stems from the Cyclewelding process developed by Chrysler before the war. By bonding the lining to the shoe there is an important gain in useful contact area and an even greater increase in lining life. In addition, brake chatter is reduced.

To simplify the sequence of events in the interest of easy visualization, the process may be divided into three major steps—preparation of the lining, preparation of the brake shoe, and assembly of lining and shoe. What complicates the situation and requires studied attention to detail and scheduling is the fact that the one brake department in the Chrysler Lynch Road plant produces brake shoe assemblies for all Chrysler Corp. cars and trucks.

To meet this enormous demand the present set-up is designed for a capacity of about 60,000 shoe and lining assemblies a day.

Taking any one assembly as an example, the process starts with preparation of the lining. The first step is to wire-brush the inner surface to remove dust and loose particles so as to provide a good uniform surface for the cement. This is done in a special machine with an automatic cycle.

The linings then enter the "cement" room, an enclosed booth provided with various safety devices to eliminate any hazard of handling volatile materials. Here are a number of automatic machines for applying cement on linings of different sizes. Each machine is fitted with a vertical magazine into which the linings are stacked. The lower lining is picked up by a pair of rubber covered rolls and pulled through with a uniform coating of Cyclebound cement. This material is of high viscosity, in liquid form, and is extruded onto the inner surface of the lining from two jets. This extrusion coats the lining with two uniform bands of cement, leaving a narrow center strip bare.

At this point the linings are placed in trays on an overhead conveyor and proceed through a steam-heated drying oven, mounted overhead. The temperature of the oven is held below 180 F which is below the curing temperature of the cement but is sufficient to evaporate certain volatile solvents. Thickness of the dry coating (varying with the size of linings) is held around 0.010 to 0.016 in.

Simultaneously, in another section of the department, we see the start of the brake shoe line. Here the parts are transported in pans to a large Bonderizing unit served by an automatic dip conveyor system where they are transferred to the conveyor racks. The object of this treatment is to produce the chemical cleanness of metal essential to perfect bonding. Dis-

tinctive feature of the process is that unlike conventional Bonderizing, it leaves an exceptionally thin deposit simply to prevent atmospheric attack while the parts are in process.

At the exit end of the machine the shoes are removed and transferred to an adjacent monorail conveyor where they are suspended on horizontal bars.

Returning to the linings for a moment, we find that as they leave the drying oven, the oven conveyor dips to table height at the junction with the conveyor carrying the Bonderized brake shoes mentioned above. Here the operators transfer linings to pans on the latter conveyor, taking care to match the linings with the proper shoes.

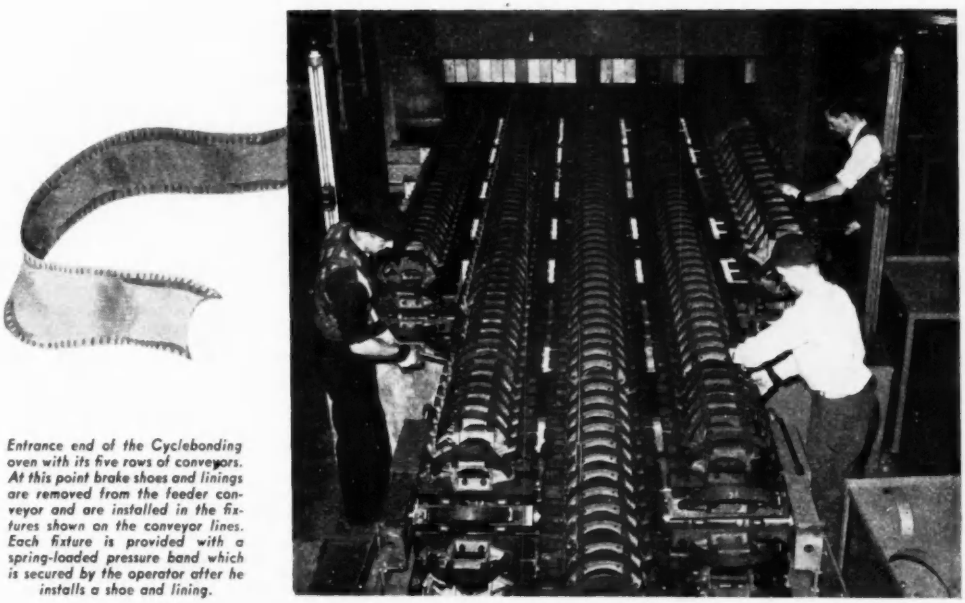
The conveyor carrying linings in trays and shoes on bars now threads about the loading end of the main drying oven in which the cement is cured. At this point, as illustrated, the oven exposes a row of five individual oven conveyor chains, carrying closely spaced fixtures fitted with pressure bands. Operators fit a shoe and its mating lining into the fixture and set the pressure band securely, the springs in the fixture applying a load of around 300 psi minimum; up to 800 psi for truck bands.

There are two ovens in this department, each about 100 ft in length. Each can produce about 3750 pieces an hour. Total time in the oven is around 50 minutes for the complete cycle.

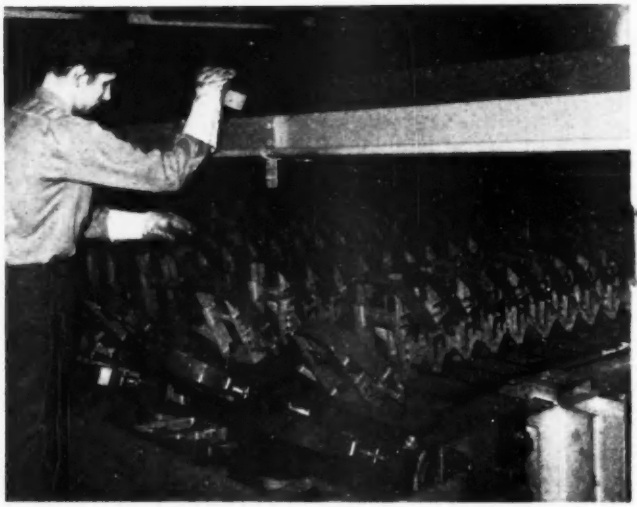
The curing cycle and its control constitutes the basic stage of the operation and provides the principal assurance of perfect bonding. Each oven is divided into a number of controlled heat zones designed to provide a precisely defined temperature gradient from entry to exit. The control criterion is the temperature at the cement line and this is held to 350 F plus or minus 10 F for the last 20 minutes of the cycle.

To assure these precise conditions of temperature control, the oven is provided with an automatic electronic recorder of latest type which traces a chart at regular intervals to provide a record of the temperature gradient. To this end, they have a thermocouple fastened to a 100-ft length of wire which is inserted

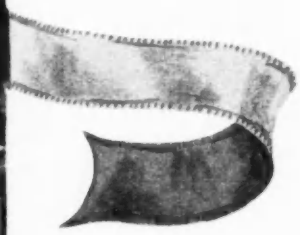
Brake Linings for Cars and Trucks



Entrance end of the Cyclebonding oven with its five rows of conveyors. At this point brake shoes and linings are removed from the feeder conveyor and are installed in the fixtures shown on the conveyor lines. Each fixture is provided with a spring-loaded pressure band which is secured by the operator after he installs a shoe and lining.



Exit end of Cyclebonding oven. At this point the pressure bands are released by the operator and bonded shoes removed from the fixture and dropped into the chute directly above the fixture conveyor. As described in the text the chute carries the shoes to a transfer conveyor and the latter moves them along the inspection station.



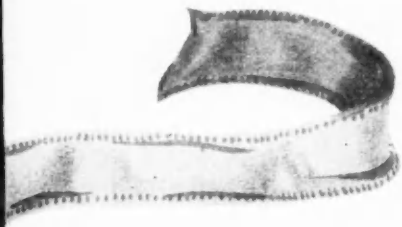
in a sample shoe at the loading end at the cement line and continues through the oven to the exit end where it is detached and returned to the starting point for the next sample reading.

When shoe and lining assemblies reach the exit end of the oven they are removed from the fixture and dropped onto an inclined chute which carries them to a table-high transfer conveyor. The latter serves as the inspection station. A group of inspectors along this line gives the work a practical visual inspection. Then they hang the shoes on an adjacent monorail conveyor for transport to the paint spray booth. Work continues on this conveyor through the spray booth and through an overhead oven for drying the finish.

At the exit end of this drying oven the conveyor dips at a machining station where the rear shoe assemblies are removed for grinding the OD. Here they have a number of grinders of special design, as illustrated. These are of vertical spindle type having a single wheel. Brake shoes are mounted, two at a time, in the fixture which is arranged to rotate at high speed. The operation produces an accurately finished curvature, held to close tolerance as to radius and alignment.

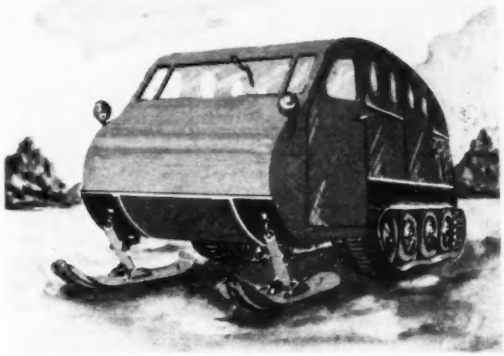
Front wheel shoes are not ground here. Instead, they are shipped to the divisions as they come off the last drying oven conveyor and are ground by each division to suit its requirements.

The outside surface of linings on rear shoes only is ground to close tolerances in a battery of special vertical grinders, one of which is shown here. Shoes are fitted in the revolving fixture seen in the center. Grinding is done with the small wheel on the vertical spindle in the background.



The Snowmobile,

Canada's Winter Vehicle



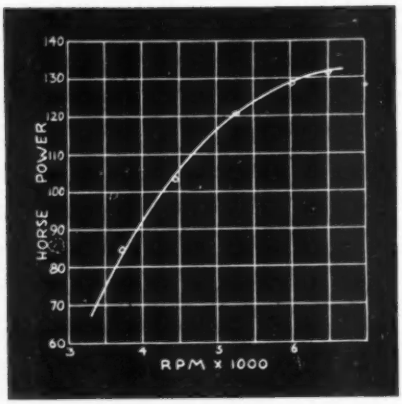
Drawing showing exterior details.

DESIGNED for traversing snow-covered highways and country terrain, the Snowmobile has become one of the established types of motor vehicles in Canada with over 3000 now in use there. This half-tracked vehicle, steered by skis and propelled on caterpillar tracks, is being produced in two models at the rate of about 1000 units a year by L'Auto-Neige Bombardier Limited factory, which is located at Valcourt, Quebec Province, about 75 miles south of Montreal. Recently the Minnesota FWD Corp., Inc., was appointed a distributing agency in the United States.

The Snowmobile, which weighs 3600 lb and has a maximum speed of 45 mph, is equipped with a 115 hp engine, clutch, three-speed transmission, universal joints, propeller shaft, and differential, all of Chrysler make. The frame is of all-welded construction with the bottom of the chassis shaped like a toboggan so that the car can slide over deep snow. The body has a hardwood frame with plywood panels. On each side of the bogie are four wheels equipped with pneumatic tires and located between two rubber belts to which metal cross pieces are bolted to form the track. Sprockets are rubber - covered to minimize noise. For heating, warm air is circulated between the flooring as well as in the body.

The two models, B-12CS and C-18, are the same mechanically, the only difference being in width. The C-18 is 16 in. wider with seating for 15 to 18 passengers as compared to 12 passengers in the B-12CS. Payload is approximately 1½ tons. Among their new uses are school buses and tractors to move wood out of the forests, averaging loads of 12,000 to 15,000 lb.

The Snowmobile moving up a snow-covered hill.



Power curve of the Offenhauser 102 cu in. midget engine. Compression ratio is 15 to 1 and the fuel methanol.

The Improved

By Lou Meyer
Vice-President, and
Leo W. Goossen,
Chief Engineer,
Meyer & Drake Engineering Corp.

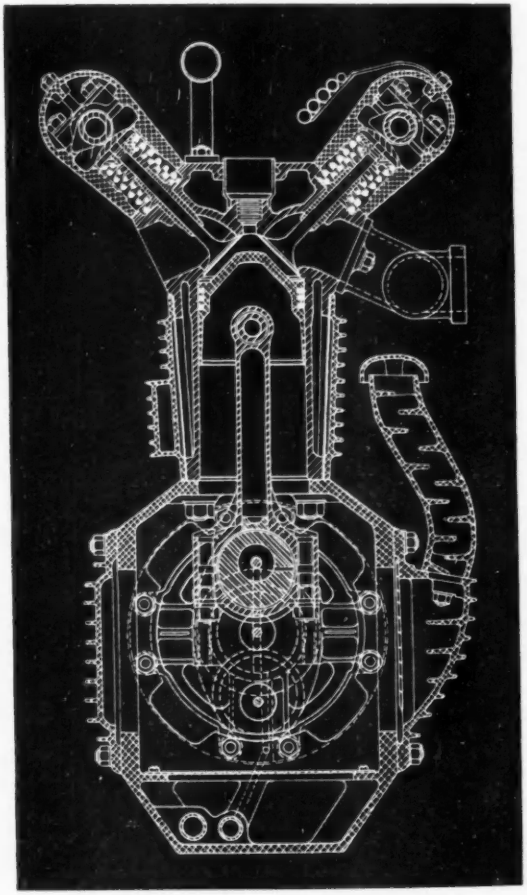
Rated brake hp, 125 at 6000 rpm;
Top revolutions, as high as 7000 rpm;
Number of main bearings, 3;
Overall length, 23 in.;
Overall height, 22 in.;

In recent years midget automobile racing has become very popular, ranking next to baseball and football from the standpoina of paid admissions. The speed of the little cars is phenomenal, being at the rate of 65 to 90 mph average on circular tracks of from $\frac{1}{4}$ to $\frac{1}{2}$ miles in length. The power plants of these cars are limited in piston displacement by certain regulatory formula and they must have sufficient power to produce this exceptional performance, and at the same time engine weight and overall dimensions must be held to a minimum.

The Offenhauser Midget engine, manufactured by the Meyer & Drake Engineering Corp., Los Angeles, Calif., is used by a great many of the midget racers, more than 400 having been built to date. The original design, patterned after the Indianapolis big car racing engines, was first built in 1934 to meet a demand for this type engine. The basic design has remained practically unchanged from that date although improvements have been made from time to time, in valve timing, compression ratios, bearing design, etc., for better performance and increased reliability.

The following description and specifications apply principally to the 1949 model:

Number of cylinders, 4;
Bore, 3.000 in.;
Stroke, 3.625 in.;
Displacement, 102 cu in.;
Compression ratio, 15 to 1 using methanol fuel;
11 to 1 using gasoline fuel;



Transverse section of the engine showing details of the valve operating mechanism, crankcase, connecting rod, etc.

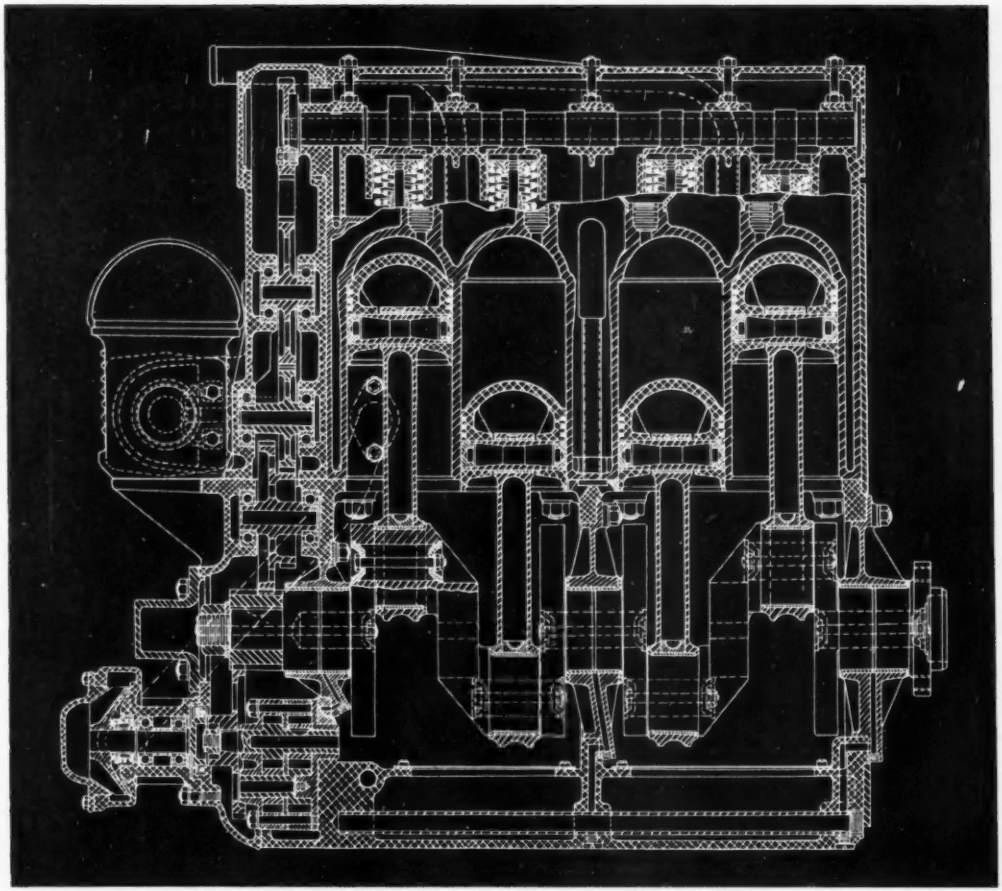
On the opposite page is a longitudinal section of the Offenhauser Midget engine.

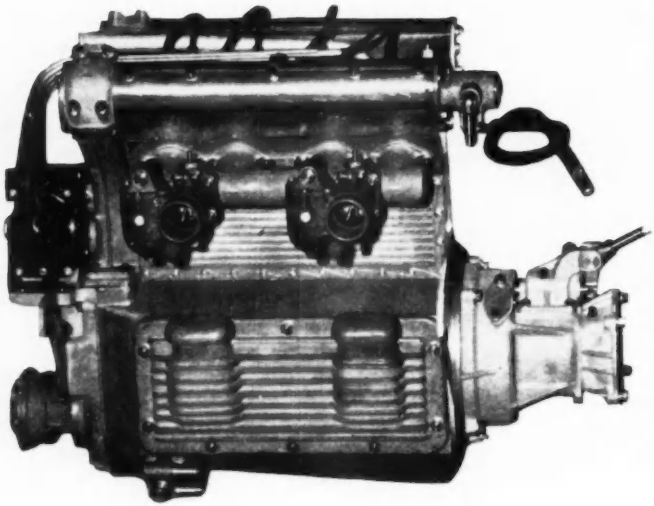
1949 Offenhauser Midget Racing Engine

Overall width, 13¼ in.;
Weight, including in and out engagement of clutch, 237 lb.

The engine is the double overhead cam type, valves being inclined 45 deg from cylinder center-line and seating directly in the cast-iron hemispherical combustion chamber. Port diameter for the intake valves is 1⅜ in. and for the exhaust valves 1 5/16 in.

Valves have 45 deg seats and 19/64 in. stems. Material for the intake valve is SAE 3140 steel and an austenitic steel is used for the exhaust valves. Valve guides are Meehanite castings machined to give a stem clearance of 0.002 in. for the intake valve and 0.004 in. for the exhaust valve. No valve adjustment is provided, 0.016 in. and 0.18 in. clearance being given for the intake and exhaust valves respectively at time of assembly. Valve lift averages 0.400 in. although both higher and lower lifts are frequently used. The valve





Left side view of the Offenhauser power plant.

timing of the cam designated No. 4 is as follows: Intake opens 20 deg btc and closes 56 deg abc; exhaust opens 48 deg btc and closes 17 deg atc. Both tangential and constant-acceleration cams are available, choice is determined by type of racing and buyers preference.

Camshafts are nickel-iron castings, completely machined, running directly in the aluminum housings and lubricated under low-pressure oil. They are driven through a train of 10-pitch spur gears, backlash being limited to 0.003 in. to 0.004 in. Gear material is 4620 steel, carburized and hardened. All gears are ball-bearing mounted and lubricated by splash.

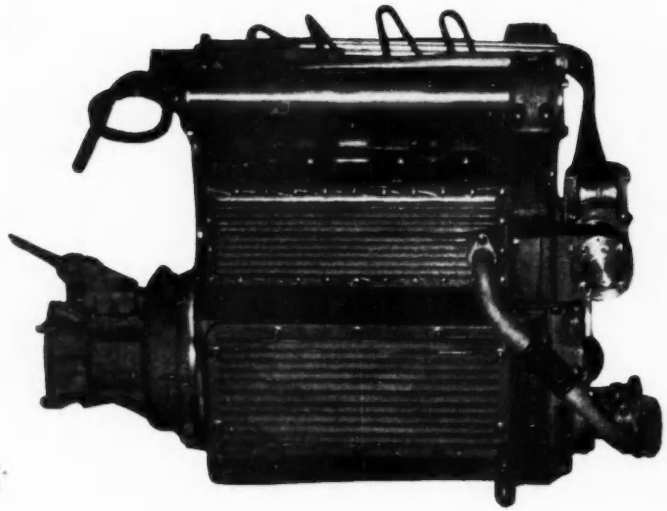
Valve tappets surround double valve springs which exert 250 lb pressure when valve is fully open. Tappets have been a 1½ in. radius top which has a hard-chrome plated surface. A key is used to prevent tappets from rotating. The cylinder block is a one-piece casting, the material being nickel molybdenum iron. It is completely machined on the outside, water passages are large and valves amply cooled. The block is fastened to the crankcase by eight 7/16 in. studs. Aluminum block castings with cylinder sleeves shrunk in and valve-seat inserts have been tried with good results.

The aluminum crankcase is the barrel type, incorporating a dry sump base. Hand-hole openings are provided on each side of case for assembly purposes. This type design is used for rigidity as well as simplicity and is common on many racing engines.

Connecting rods are fabricated from drop-forgings of 4340 steel and completely machined. The rods are 6.625 in. long center to center, and have a straight shank drilled for lightness. Strengthening ribs are machined integral connecting to bolt-bosses. The bolts are 7/16 in. in diameter, necked down for added strength. They are tightened with a torque wrench set to 25-30 lb ft. No locking means have been found necessary for the nut, and after two years of following this procedure there is no record of a nut coming loose when it was properly tightened.

The crankshaft is machined from a solid round billet of 4340 steel and heat treated to Rockwell 35-38 C scale. Main bearing journals are 2¼ in. in diameter and crankspins 2⅛ in. in diameter with ⅛ in. radius fillets. Both pins and journals are hollow drilled for lightness. Oil is retained by aluminum alloy plugs, held in place by ¼-in. bolts. Shafts are counter-balanced for smoothness and reduction of bearing loads. The weight of the crankshaft complete is approximately 35 lb. All shafts are magnafluxed for checks and cracks before using.

(*Turn to page 74, please*)



Right side view of the 102 cu in. midget engine with positive type in-and-out dog clutch.

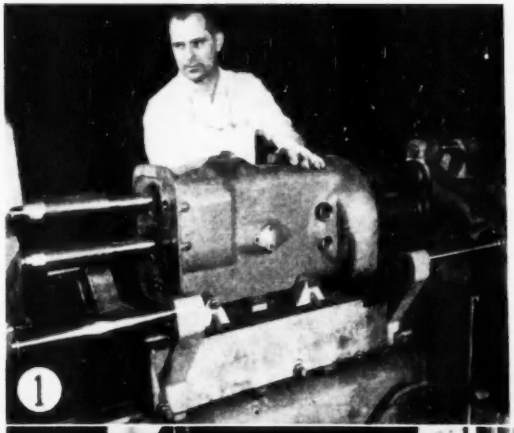
Tooling for Volume Production of Tractor Components

To dovetail with the production program of Harry Ferguson, Inc., which began the manufacture of small farm tractors last year, the Detroit Gear Div., Borg-Warner Corp., established manufacturing facilities in a plant at French Road in Detroit for producing transmission, rear axle and hydraulic pump assemblies. These units are fabricated, assembled, and tested by Detroit Gear, then transported to the Ferguson assembly plant on pallets ready for installation on the tractor assembly line.

To build the Ferguson units, the shop is tooled for volume production with special purpose machines capable of high precision and hence giving full assurance of interchangeability of parts. The plant has a large number of Baush vertical and horizontal way-type machines for drilling and tapping, Sundstrand, Newton and Cincinnati mills, and a large Kearney & Trecker three-way mill. In addition, there are Ex-Cell-O precision boring machines, Fay automatic lathes for rough-and finish-turning, New Britain chucking machines, W. F. & John Barnes horizontal way-type machines, and other equipment.

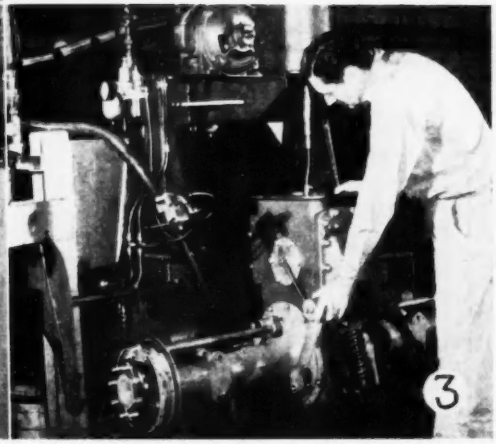
The illustrations include two examples to indicate the pains taken to assure dimensional accuracy as well as alignment at final assembly in the tractor. The first of these is a two spindle Ex-Cell-O single-end precision boring machine for finish-boring the two main bores in the transmission case. As pictured here the machine has two long, massive boring spindles fitted with single point Carboloy tools. Massiveness and rigidity are essential not only because the bores are large but also because the bores extend through two bulkheads, thus re-

(*Turn to page* 62, *please*)

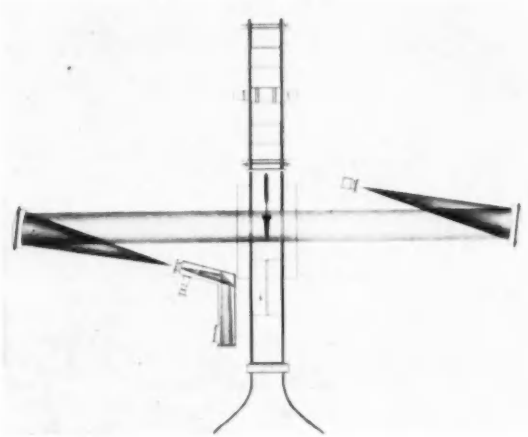


1. *Attention is drawn to the size and massiveness of the W. F. & John Barnes two-way drilling machine deemed essential for maintaining accuracy in machining operation in the transmission case*

2. *Close-up of work station of single-end Ex-Cell-O precision boring machine showing a Ferguson transmission case clamped in the massive fixture. Note the two large diameter boring spindles at the right.*



3. *Here is a view of the final inspection fixture for Ferguson rear axle assemblies. The gearing is driven by an overhead motor—at the top center—through a flexible shaft. The operator is enabled to test for gear noise, the functioning of the pump, and sealing at axle ends.*



Cutaway drawing of North American Aviation supersonic wind tunnel. Major units, left to right, air vacuum pump building, sphere-like vacuume chamber, test section and office building, and dry air storag tank.

Schlieren optical system consisting of light source, right center, which directs a beam of light to a parabolic mirror, right, which in turn reflects parallel rays through test section, center, to another parabolic mirror, left. From the second mirror, the light is focussed upon a knife-edge assembly located in a camera, lower left center. The parallel light rays are deflected in the test section proportionately to the changes in the density of the air stream as it passes over the model, revealing aerodynamic information regarding supersonic airflow.

N. A. for

By O. W. Boden

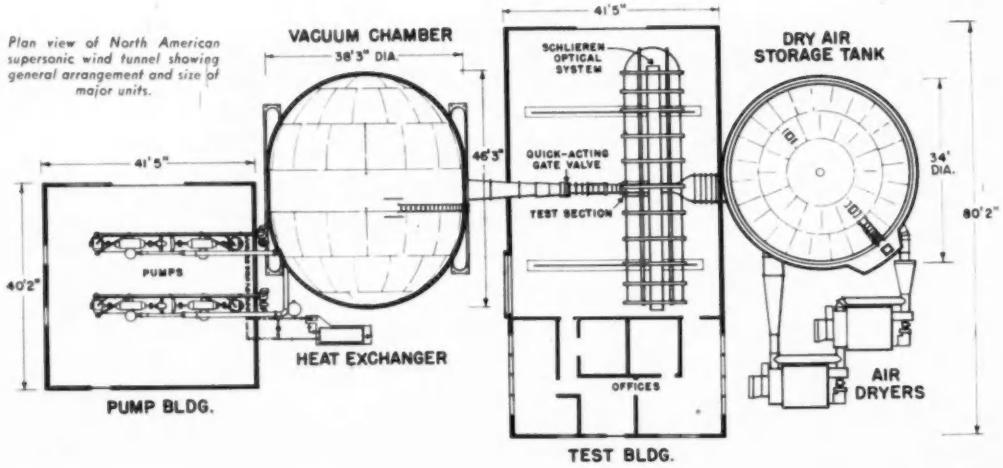
Chief, Equipment Design Section
Aerophysics Laboratory
North American Aviation, Inc.

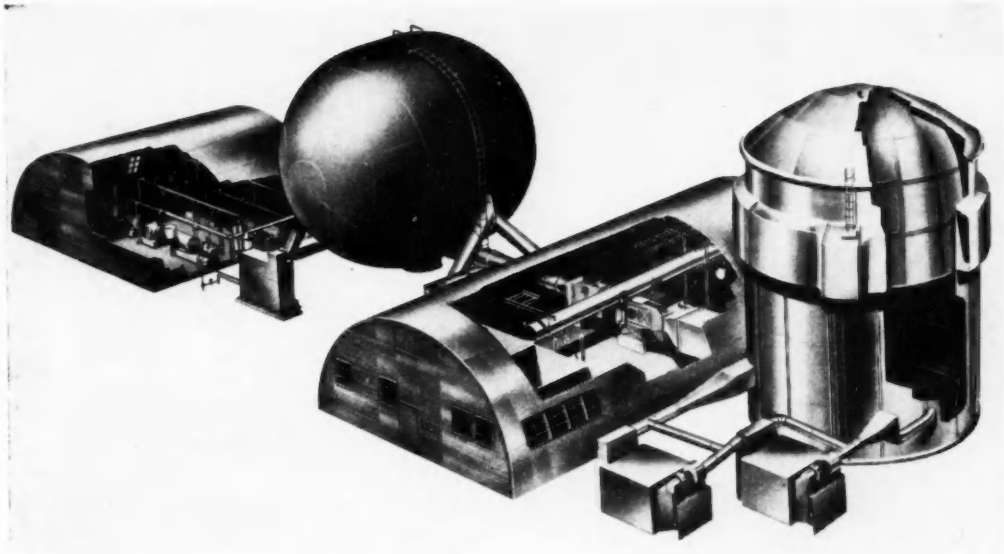
THE accelerated developments in aircraft propulsion methods, as a result of the last war, have made possible flight speeds beyond the velocity of sound. Due to the relative invulnerability of a vehicle traveling at speeds equivalent to rifle bullets, supersonic flight is assuming ever-increasing importance in aerial warfare.

Testing facilities for supersonic aerodynamics in the United States are somewhat limited at the present time. North American gained valuable experience in this field through the design and construction of a small supersonic research wind tunnel in 1946. This tunnel has provided operational and design information which was later used in the design of the larger supersonic wind tunnel. The small tunnel has a 1.75 by 4.50 in. test section and uses the plant's compressed air supply. Conditions equivalent to velocities up to 2700 mph at sea level have been obtained with this equipment.

The cost of meeting the power requirements for a larger continuously-operating supersonic wind tunnel

Plan view of North American supersonic wind tunnel showing general arrangement and size of major units.





Supersonic Wind Tunnel Testing Up to 4000 MPH

would be prohibitive to all but Governmental agencies. For this reason North American officials decided upon erecting a non-continuous flow (intermittent) type tunnel. This type of tunnel attains the same velocities with models of the same size as in the continuous flow tunnels, but at a fraction of the cost.

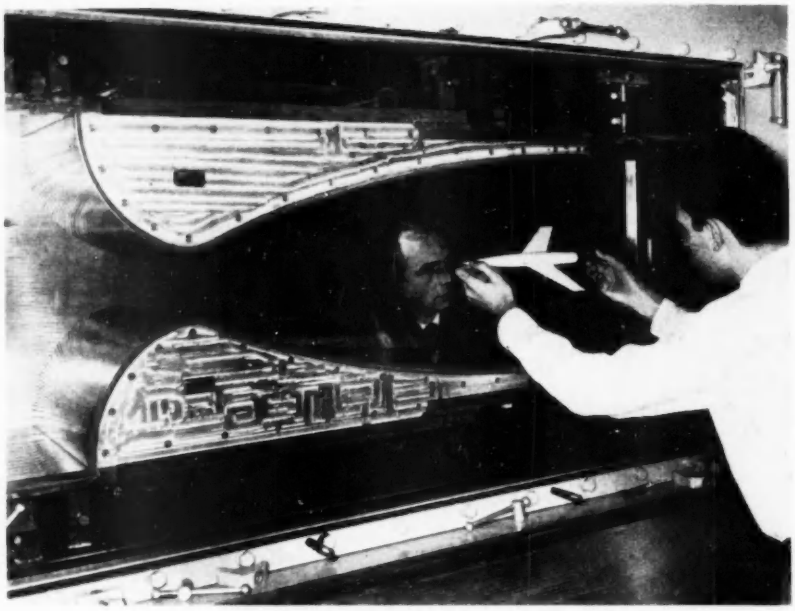
The supersonic wind tunnel erected at Kochel, Germany, is an excellent example of the intermittent-flow type of tunnel. The supersonic aerodynamic developments of the V-2 missile were carried out in this tunnel which began operating in 1937.

North American's new intermittent-flow type supersonic wind tunnel is capable of producing Mach numbers from 1.22 to greater than 5, which correspond to speeds of 930 to 4000 mph at sea level. It was patterned after the German Kochel tunnel, which has been moved to the United States and is being operated by the Naval Ordnance Laboratory at Silver Springs, Md.

The operation of the tunnel is relatively simple. Instead of air being blown in a steady, uninterrupted stream through the tunnel as in a continuous-flow pressure type, the air is drawn through by a vacuum. The duration for each run averages about 18 seconds. The test unit has a cross section of 16 by 16 in. which enables the use of relatively large models. The vacuum chamber has a capacity of 36,000 cu ft which insures runs of at least 15 seconds at all attainable Mach numbers. The vacuum pumps employ a maximum of 400 hp to evacuate the vacuum chamber between runs, and an average of seven tests or runs can be made in an hour. Automatic devices and instruments are used to record the experimental data during a test run.

This facility consists of four major units: (a) the dry air storage chamber and air drying equipment, (b) the test building, which contains the tunnel proper and a data reduction office, (c) the vacuum chamber, and (d) the pumps and pump building.

If the air is not dried before entering the system, the normal moisture will condense when it reaches the very low temperatures in the test section, and form a fog as well as a condensation shock, thereby preventing visual study of the shock wave pattern around the model and erroneous force measurements respectively. Therefore, an air drying system using two commercial air drying units capable of drying the air to a dew point of —20F is used, with the dried air then being stored in the storage tank. In order for the stored air to remain at constant pressure (atmospheric), the upper part of the dry air storage tank contains a large flexible membrane that rises as the dry air is pumped in under the membrane in the storage chamber by the air dryers, and then later falls as the air is sucked into the tunnel during the test runs. This membrane separates the dry air from the rela-



Mounting a guided missile model in the test section. Nozzle blocks, made of selected hardwood and mounted between aluminum plates, are shown here exposed with test section door open. Blocks of various sizes are used to provide air speeds equivalent to 930 to 4000 mph at sea level.

tively wet air that is outside of the storage tank, and permits the use of relatively inexpensive equipment for air drying.

The test building houses the wind tunnel proper. The tunnel consists essentially of ducting that connects the dry air storage tank with the vacuum chamber. This ducting is made up of the following units, starting from the dry air storage tank and progressing to the vacuum chamber: (a) the contraction section, (b) the inlet gate valve (used for closing off the dry air storage chamber), (c) the working section (where the test section, nozzle blocks, and models are located), (d) the variable diffuser (which improves the efficiency of an intermittent flow type tunnel), (e) the quick-acting gate valve (which starts and stops the air flow through the tunnel), and (f) the fixed diffuser.

The vacuum chamber is a steel structure with two hemispherical heads attached to a central cylindrical band. The heads have no internal bracing. The chamber is designed to withstand a complete vacuum and under running conditions will normally operate between a 30 per cent and 99 per cent vacuum. When completely evacuated the chamber has a total external force of 12,000,000 lb acting upon it.

The pump building houses the vacuum pumps used to evacuate the vacuum chamber. These pumps are capable of evacuating the chamber from atmospheric pressure down to a 99.0 per cent vacuum in 37½ minutes. The pumps have a capacity of 5880 cu ft per minute of free air.

Taxes and Demagoguery

By Louis Ruthenburg

A hundred years ago Marx and Engels published the Communist Manifesto. There is set forth the program for bringing about communism. The second step recommended in that program is a graduated income tax. In 1914 we, the people of the United States, first applied that phase of the communist program.

Our graduated federal income tax was instituted after years of debate, after the Supreme Court of the United States had declared such a tax unconstitutional and after constitutional amendment. The early rates were not burdensome, although a few fearful souls then expressed the fear that upper bracket rates might some day go as high as five per cent!

Relatively innocuous over a long period, our tax policy now destroys incentive and so dangerously restricts investment that the future of our enviable economy is threatened.

History may reveal that 1914 was the fateful year of the United States of America. Then we applied tax measures destined to threaten our beneficent free economy, and in the same year there was enacted the first of a series of laws which violate the basic precept of equality under the law by bestowing special privileges upon labor unions.

There is the Clayton Act, for example, which was enacted in 1914 and which holds labor organizations to be immune from provisions of law which impose penalties for monopolistic practices.

Then the Norris-LaGuardia Act of 1932 limits our courts of law in the matter of enjoining labor unions, although it does not limit the power of injunction with respect to other groups or individuals.

The Wagner Act, which became the law of the land in 1935, provides penalties for certain "unfair labor practices" on the part of employers. It, however,

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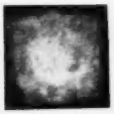
Measuring Piston Ring Wear to One Millionth Ounce

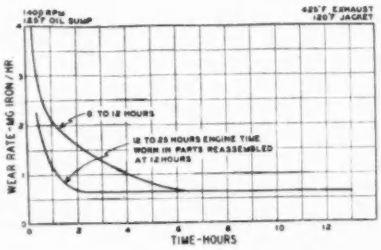


Radioactive piston rings permit measuring metal worn from them to as little as one millionth of an ounce. In this photo a radioactive piston ring, inside the expander, is being removed from the protective lead case at the laboratories of the California Research Corp., Standard Oil Co. of California subsidiary. It then was installed in a single cylinder test engine and after four hours of operation a sample of oil taken from the engine. A Geiger counter was used to measure the amount of metal worn from the activated ring.

Testing the radioactivity of a piston ring before running a test. The pointer on the gage indicates how "hot" the ring is. It was irradiated at one of the Atomic Energy Commission's chain-reacting piles at Oak Ridge.

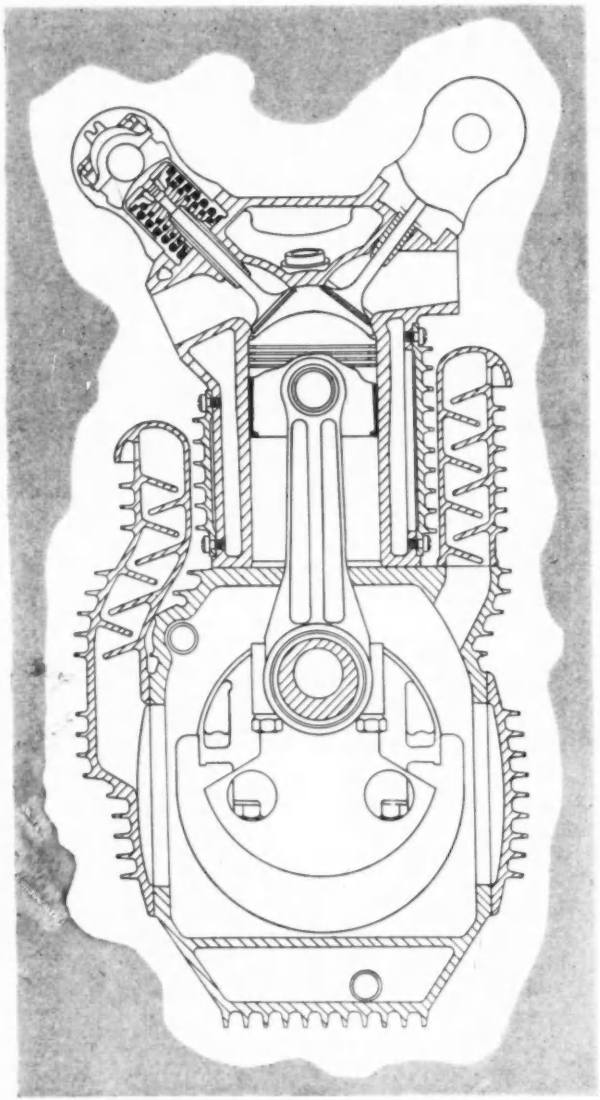
Pouring back sample of oil after Geiger counter test.

Wear rate of piston rings during break-in-single cylinder, 4 cycle Diesel engine—4¼ inch bore.



Measuring the amount of metal worn from radioactive piston ring by testing a sample of oil from the crankcase with a Geiger counter.

Sparks "Little Six" Being For 1949 Indianapolis



Cross section of the Sparks engine showing details of the valve mechanism.

ALTHOUGH four end eight cylinder engines are by far the most popular for automobile racing, the Sparks "Little Six" has demonstrated that a six can perform as well as engines having more or less cylinders. Developed especially for racing at the Indianapolis track, it powered the car that won the "500" there in 1946 with George Robson at the wheel. Since then it has not raced at Indianapolis due to being involved in the drivers strike in 1947 and last year it developed a cracked cylinder block before the race. The car, now owned by Ray T. Brady, automobile dealer, has been entered in the coming May 30 classic at Indianapolis. The engine was returned to Art Sparks, its designer and builder, for rebuilding, which consists of the following:

Install complete new cylinder block together with its component parts such as valves, guides and springs, rebabbit and line bore all bearings, regrind crankshaft, make and install new pistons and rings, grind new camshaft same as the one now in engine, and build new intercooler which will be of slightly different design and is expected to give still better results.

The Sparks engine is of the double overhead camshaft type with a bore of 3.203 in. and a stroke of 3.750 in. Piston displacement is 183 cu in. Peak output (flash reading) is 412 hp at 7200 rpm; holding horsepower for one minute is 356 hp.

Supercharger boost is 18 lb at an engine speed of 6500 rpm. The Sparks-designed supercharger of non-diffuser type is torsion bar driven and has a 5.9 to 1 step-up ratio from crankshaft to impeller speed. Oil at 18 psi pressure is supplied to the plain lead-bronze spindle bearing

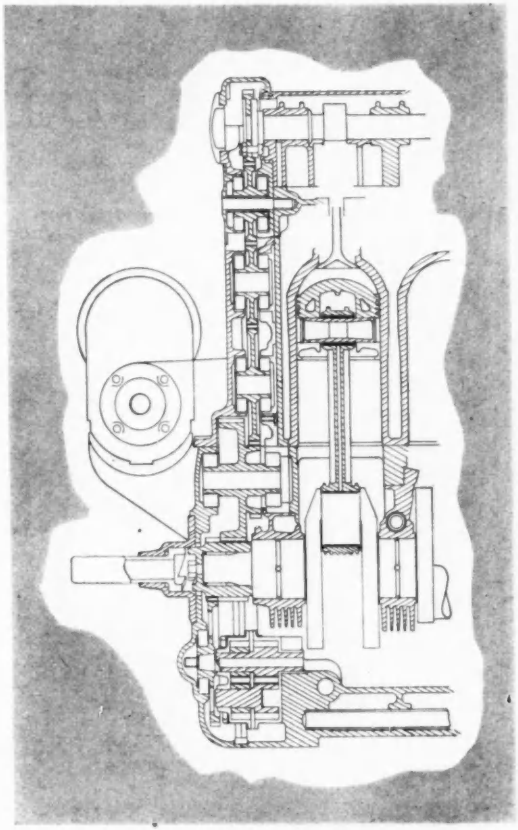
Rebuilt Race

from the supercharger's self-contained dry-sump oiling system through a distributing ring in the sleeve which is provided with veins to carry pressure to the thrust face. A step type oil slinger ring forms the seal between the bearing and back face of the impeller.

Satisfactory operation of the spindle bearing is due to the accurate meshing of the three driving gears spaced at 120 deg around the spindle. These gears are ground with a tolerance of 0.0002 in. Housings also are held to the same close tolerance. It is said that the lead-bronze bearing shows no appreciable wear after 2500 miles of racing and practice driving on the Indianapolis track.

The supercharger is located between the carburetor and the intercooler. Fuel used is ethyl alcohol anhydros. Compression ratio is nine to one.

Intake valves have a head diameter of 1.75 in., a lift of 0.406 in. and a seat angle of 30 deg. Head diameter of the exhaust valves is 1.625 in. with the same lift and seat angle as for the intake valves. Intake valves open seven deg before top center and close 40 deg after bottom center. Exhaust valves open 42 deg before bottom center and close 10 deg after top center. Tappet clearance (cold) is 0.023 in. intake, 0.030 exhaust.



Longitudinal section at front of engine showing arrangement of timing gears, oil pump, etc.

Pistons are sand cast aluminum alloy. They weigh 360 grams each and are provided with two 0.0625 in. compression rings and one 0.155 in. oil ring.

Connecting rods are SAE 6140 steel, heat treated for a hardness of Rc 40. Rod weight is 912 grams and center-to-center length is 7.125 in. The nickel babbitt bearing is 2.062 in. in diameter.

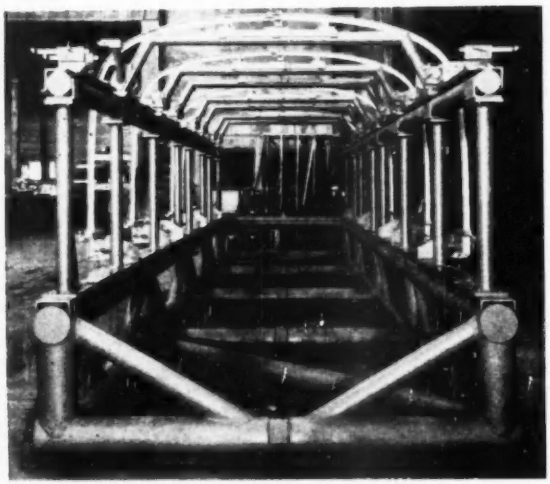
George Robson in the 1946 Indianapolis winner. Robson was killed later that year in a dirt track accident in Georgia.

Aircraft Fixtures Adapted

TWIN COACH CO., with plants in Kent, Ohio, Buffalo, N. Y., and Canada, has developed a number of very efficient fixtures for sub-assembly and assembly of practically all body parts for its gasoline engine driven buses. In making the changeover, aircraft production techniques were adapted to bus production, and thousands of feet of obsolete aircraft fabrication fixtures were cut up or disassembled, and then reworked into body assembly fixtures.

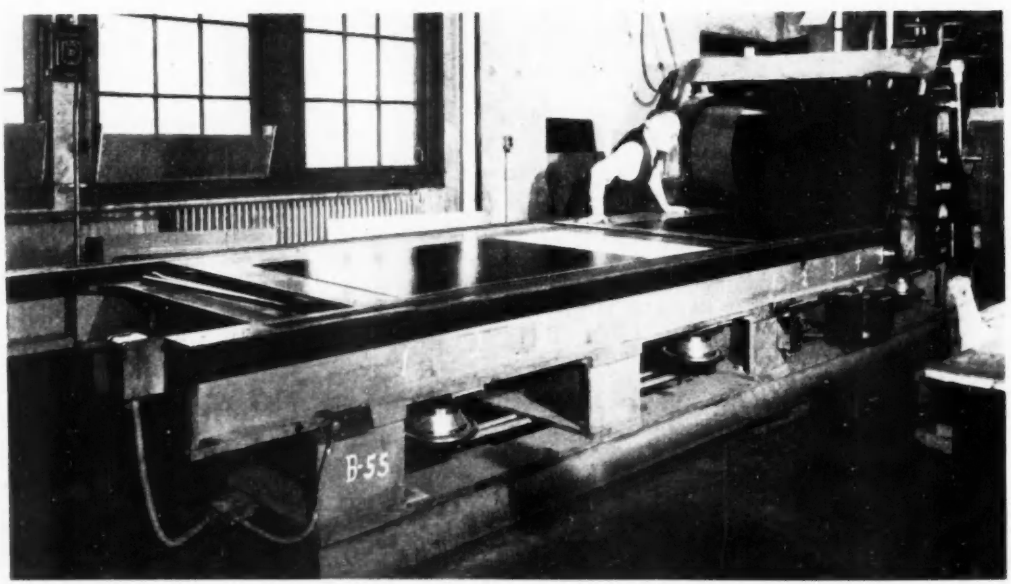
These fixtures were designed by James Milliken, superintendent of tooling, and aides at the Buffalo plant, and the work was done in the plant tool room. For accuracy in construction, fabrication proceeded with transit level, spirit level, straight edge, height gage, vernier tool and plumb bob.

As rigidity was desired in fixture substructure, steel oil casing of graduated sizes up to about 10 in. diameter was used for sub-structure members. Angle iron of varied sizes was used in other phases of construction. As a fixture was completed, it was moved as a unit to its place in the production layout.



Oil casing tubing, welded construction, and leveling lugs are among the features of this walk-in fixture for roof section building.

Prints are made on metal or wood on this printing machine, working from templates and lofted dimensions.



to Building Bus Bodies

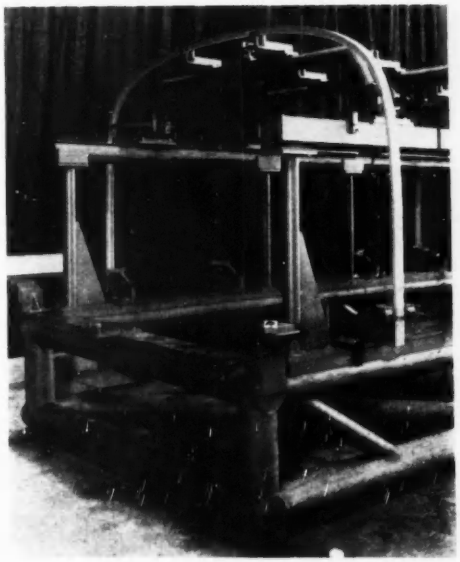
By Walter Rudolph

All fixtures have leveling lugs where they touch the floor, and once a fixture is in place, adjusting bolts, straight edge, and spirit level or transit are used to bring it level.

One of the largest and most expedient fixtures is a walk-in setup used to bring together bus roof sections, down to about midway of the bus structure. It is designed for minimum interference with workers, some seven gangs of which can do assembly work with it simultaneously.

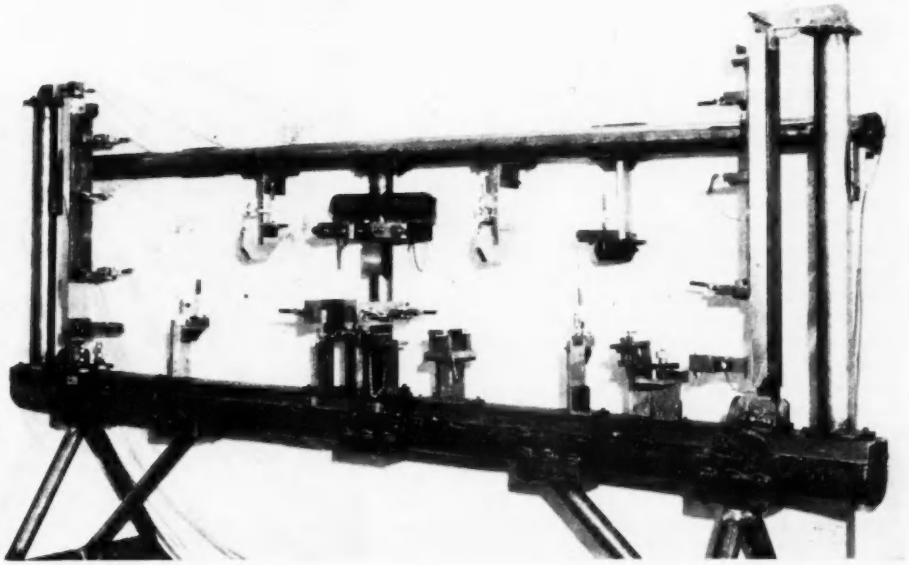
The permanent vertical center of the fixture is maintained with targets, painted red, located on five cross tube members. Targets on fixture sides establish centers for carlines. Sides of the fixture are sectioned, each section made for a window.

Base plates for each section are made of machined steel and are jig-bored for accuracy in leveling. They are suspended on headless screws which are alongside of each locating bolt, all of which rests on angle iron on top of tubing subframe members. No shimming is



Close-up view of carline locators for roof section showing locating plates for different shapes.

Below is the fixture used for the front lower assembly. All fittings are adjustable for different models.



Carlines are checked for curvature against positively located angles on a table and corrections are made by means of the push-pull bending device.

to a template. A manual worm gear arrangement, made by Twin Coach, is used to straighten slight imperfections, by pulling or pushing, work being done on one corner of this table after removal from the angle locaters.

We have the picture, then, of very accurately formed parts coming to the top assembly fixture. A worker takes a carline, fits it into a slot, pins go into tooling holes and locaters are met, and clamps are closed. After carlines are in, skin pieces are easily fitted into place. Electric and air facilities are right at hand, near the fixture, and power tools are used to rivet or screw during assembly.

A header piece, rolled and rigid, goes into place across carlines. It is a lofted piece which tops windows and is located by holes in carlines. Sub-assembled windows snap into locaters and are tied into carlines. Alumilastic sealer is used in some joints before riveting or screwing.

A longitudinal stiffening belt is sub-assembled with skin pieces, which then go a chassis or bottom fixture, as it is called. In this fixture, primarily of the same construction as noted before, all trusses for the chassis are brought together for the bottom half of the bus and the rear end. (Top of rear is made in roof canopy assembly.)

This fixture has its sub-framing covered for the comfort and higher efficiency of assembly workers. It

(*Turn to page* 70, *please*)

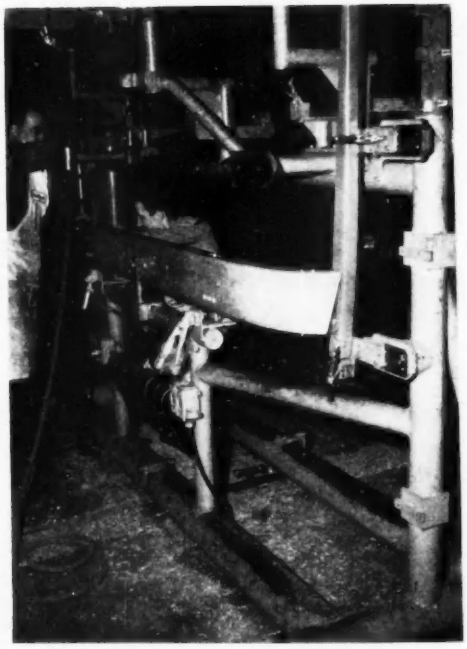
ever permitted on these base plates.

Locating bolt holes at strategic intervals along fixture sides makes it easy for assembly workers to change from one to another of the six current bus models being manufactured. In a minute or so, with each man in a crew of a dozen or more doing an allocated duty, a crane can lift off the top of the fixture, base plates can be removed or slid along, and bolts placed in different holes.

Locating clamps, cleco pins, slots and tooling holes in bus parts are factors in the actual assembly work. Assemblers are not permitted to make any basic adjustments of fixtures—a tool man does this work.

Aluminum skin pieces of the bus top are lofted. From a template, pieces are drafted on sensitized steel, scribed, and a roller picks up the impression to make a number of metal prints. Pin holes for locating on the fixture are accurately marked and drilled.

Carlines are bent on a stretch press. Then they are laid on a special table in angle locaters, and compared



Smaller fixtures such as this one for front lower assembly, are of the same tubular construction and have the same type of locators, clamps, etc., as the larger fixtures.

Passenger Cars and Production Problems Highlight

SAE Meeting

By Joseph Geschelin

THE SAE National Passenger Car, Body, and Production Meeting, held in Detroit last month as one of the current series of streamlined national meetings, with E. N. Cole, chief engineer of Cadillac as general chairman, was pronounced a signal success from the standpoint of interest and attendance. The Production Clinic, developed under the chairmanship of the writer, was a central attraction primarily because it represented an experiment of major proportions. Featuring a wide range of subjects related to the manufacturing process, the clinic had seven individual panels in operation simultaneously, the eight panels on the program encompassing a group of 57 acknowledged experts in their field. From the standpoint of attendance clinic day was an almost extravagant success, drawing somewhere around 700 production men from plants all over the country.

Much of the discussion at the Preventive Maintenance meeting centered about chip disposal. There was lively debate regarding the use of chips conveyors as contrasted with removal by hand methods. The advantages and disadvantages of both methods were touched on and it was interesting to find that some of the larger plants favored hand methods and were using them. All agreed, however, that the first problem was to provide adequate means for getting chips out of the machines.

Among the other subjects receiving comment were: how to handle spare parts for older machines, how to determine what stock to carry, etc.; and the lubrication of conveyors, particularly lines running through ovens and furnaces. Considerable interest was shown in the maintenance of machine tools with the incident problems of hydraulic systems, electrical systems, and accessories.

The Surface Finish panel was another new venture designed to air the problems to be considered in setting up industry standard specifications. Much of the discussion centered about the use of instruments such as the Profilometer, the Brush Analizer, and optical methods.

Considerable interest was expressed in the growing development of visual surface finish standards. The use of such standards is not new, but genuine interest was never as high as it is today and considerable importance is attached to new developments such as the GMR "gold" standard reference blocks, and specimens being developed by the Norton Co., among others. One of the moot points is whether or not to specify the method of machining in establishing a plant standard, since surface finish standards must be related to the nature of the machining method. The consensus at the meeting was that choice of the method of metal removal must be left to the production department.

At the sessions on Production and Manufacturing Control discussion ranged over a wide variety of interests —from sales forecasting to establish control of inventories in job lot plants, to inventory turnover, scheduling of work to meet delivery requirements, and budgetary control. Considerable interest was expressed in the application of IBM systems for planning and scheduling.

Incentives, bonus payment, and regularization of employment also were touched upon. It was agreed that in large plants, scheduling to maintain continuous production flow would do most to prevent undesirable rise and fall in employment rolls.

Gear Design and Production received unusual attention and discussion covered every phase of the problem for every conceivable type of gearing current in the industry. For obvious reasons much of the interest was on the manufacture of transmission gears and the design of lubrication systems.

While it was hoped that Inspection and Quality Control would spread to questions of inspection methods and gaging, the audience showed its interest specifically in the now spreading technique of statistical quality control. Questions dealing with the establishment of such systems in plants of every size and the nature of the line organization for the purpose easily dominated the session.

Materials handling covered the many aspects of the subject in current practice, including types of materials handlinge quipment, methods of dispatching and consideration of the economics of each problem when it is found necessary to change methods or expand facilities. It was most interesting to find that important universities in various parts of the country are considering the establishment of formal courses in materials handling and the latter part of the meeting was devoted almost entirely to this development, with several university professors contributing to discussion.

The panels on Heat Treating and Body Steel drew the largest attendance. Abstracts of papers are given at the end of this article. It is important, however, to mention that discussion centered about new methods such as austempering and martempering, and induction heating. Perhaps the most important development in press shop technique is the Bonderizing of sheet or blanks to provide lubrication for deep drawing operations, thereby increasing the ability to make deeply drawn parts without spoilage. V. M. Darsey, the author of the paper on this subject, mentioned later that phosphate coatings gave equally good results when applied to aluminum sheets.

Passenger car and body sessions will be covered by the publication of abstracts of many of the papers in an early issue of AUTOMOTIVE INDUSTRIES. By all odds the largest attendance for any single session was found on the third day at the Symposium on test methods, and later when papers were presented on the Cadillac engine, and the possibilities of using air cooled engines for passenger cars. In describing the new Cadillac engine, Barr and Cole set an enormously high standard in their method of presentation and particularly in the attention given to the solution of special problems. Every phase of the subject was completely documented with charts and tabulations, giving an unusually fine picture of how research and design were coordinated to produce the end product.

Carl F. Bachle, made a presentation of his thesis that the modern aircooled engine was the ideal powerplant for motor cars. His attack on the subject was well organized, well documented and admirably presented.

The opening session, dealing with Trends in European Design, which was addressed by Reid A. Railton, gave an unusual picture of the wide differences in design philosophy between motor car design and performance elements in the USA and Europe. The discussion period brought out considerable support for the

soundness of American design for the driving conditions in this country.

Before the end of the meeting the Production Activity committee decided definitely to schedule a similar clinic day for the next National Meeting to be held in Detroit in 1950.

Although not on the formal program of the meeting, a paper dealing with the Application of Radioactive Tracers in engine research by Pinotti, Hull, and McLaughlin, California Research Corp., was presented at one of the sessions. While the technique is as new as atomic fission and requires considerable further development, it was agreed that it offers an entirely fresh approach to the study of wear and the effects of lubricants and other factors on the life of an engine. The technique is illustrated elsewhere in this issue of AUTOMOTIVE INDUSTRIES.

Abstracts of papers presented at the Production clinic are presented herewith:

Induction Heating for Forging and Heat-Treatment

By A. W. Herbenar, The Ohio Crankshaft Co.

The use of high frequency energy for heating metals for various processing operations has long been recognized by industry as a very efficient means of effecting economies and production rates not readily attainable by other methods. Yet, recent advances in high frequency conversion equipment and auxiliary induction equipment, coupled with an immensely expanded knowledge of characteristics of induced high frequency currents, have carried the field of application of induction heating far beyond normal expectation.

As typical examples of modern trends in the application of induction heating for forging, it may be advisable to cite and briefly describe various installations which have reached the manufacturing stage or are currently in operation effecting marked reductions in manufacturing costs.

One manufacturer of automotive parts is employing a special remote induction heating station to automatically upset and manually blank two ends of a bar simultaneously. The bars are hopper fed through two channel type inductor coils which heat approximately 3 in. of each end to the required forging temperature. A transfer mechanism then transfers the bar to a double upsetter, providing the Rayo-Tube temperature control has not rejected the piece due to improper temperature. After upsetting both ends simultaneously, the piece drops into an underlying conveyor, which delivers it to a press for a manual blanking operation.

Another manufacturer of automotive parts employs a special remote induction heating unit for automatically forging one end of a cold headed blank. Blanks are hopper fed at intervals through a series of two solenoid type coils, which heat the headed end to 2200 F leaving the remaining portion of the blank cold. As the blank drops from the second coil, it is automatically picked up at the cold end by a hydraulically actuated transfer mechanism which carries the differentially heated blank into the upsetter. This unit is also equipped with automatic temperature control and corresponding selectors.

Induction heating also is currently being used for various types of heat-treating operations—namely, selective surface hardening, selective through hardening, through heat-treating and selective annealing.

A typical installation of noteworthy use of induction heating for selective hardening can be found in the following application: A manufacturer of automotive parts is now inductively hardening a part directly in conjunction with the machine operation. In this particular application the part is hardened at the eighth station of an eight-spindle machine integral with the cut-off operation. The average distortion occurring during such hardening operation is less than 0.002 in. The cutting fluid is employed as a quenching media.

Induction heating has been used in conjunction with austempering and martempering on an experimental basis. Induction heating and a subsequent martempering operation lends itself to hardening numerous small parts where distortion and residual stresses present a contending problem.

Welding as Applied to Body Construction

By John F. Randall, Ford Motor Co.

The average automotive body as presently designed, contains over 8000 spot and projection welds. Accordingly, in order to produce 5000 bodies per day, an automotive body plant must make approximately 40 million resistance welds in a 24-hour period.

In the newer designs of automotive frames, there is a definite trend to the replacement of the previous riveted construction with arc and resistance welding with a consequent increase in frame rigidity and fatigue strength. A typical frame of the newer design has approximately 600 in. of arc welding and about 170 resistance welds. About 450 in. of the 600 is deposited by automatic arc welding with the remaining 150 applied by the manual metal arc process. At a production rate of 5000 frames per day, an automotive frame plant must therefore complete approximately 250,000 ft or 47.5 miles of arc welding and 850,000 resistance welds every 24 hours.

Within the last year or eighteen months the problems of high rate production of resistance welded assemblies at minimum cost have been approached from a radically different angle. This has been made possible by the development of welding equipment capable of producing assemblies as fast as the major components are stamped. In such cases, the welding machines are integrated with the stamping press lines for major components. When suitably designed, fast operating welding equipment is placed in series with the stamping presses, and a straight line flow of material can be obtained from the original steel blank to the finished major component. Welding machines can then be synchronized with the stamping presses and the transfer of material through the stamping presses and welding machines and from one to the other can be accomplished by suitable automatic handling equipment which does not require manual effort on the part of the operators.

Bearing in mind the factors which produce the necessary temperature for the formation of a weld nugget, four principal metal conditions can be listed which may cause difficulty in the production welding of body steels. These are poor metal contact, oxidized metal surfaces, dirty or coated material and inadequate flange width or overlap of the material.

Although the results of the various metal conditions leading to production welding difficulties have been discussed, it should be understood that there are considerable variations in the degrees of difficulty that will be experienced. Obviously a heavy coating of dirt or other foreign matter will produce the unfavorable results described while a lesser amount of dirt may cause little or no trouble. The only positive criterion that can be used in establishing the limits for these various conditions is the actual production operation of a resistance welding machine. If a particular welding machine can be set for clean stock and still make acceptable welds on steel coated with a certain amount of oxide, dirt or other materials, then obviously that amount of foreign material is not harmful. However, if the machine settings must be changed, it will usually mean that the steel condition is unacceptable for high production operations since it is obviously impossible to examine the individual pieces of incoming material and change the machine settings from sheet to sheet.

Quality in Drawing Steel

By C. A. Burkhalter, Wheeling Steel Corp.

In the case of sheets of all kinds the steel industry net shipment for eleven months of 1948 amounted to 14, 820,000 tons or 24.7 per cent of finished steel shipments, by far the largest commodity item of the total.

Deep drawing sheet steel requires the absorption of applied forces by definite amounts of deformation and stress and some of the properties which affect its behavior are rupture strength, rate of strain hardening, and flowability. Complicating the evaluation of these properties are shop practices such as lubrication, speed of drawng action, hold down pressure, and intricate designs. With all of these variables, any satisfactory test should meet the following requirements:

1—Rate material somewhat closely to actual press performance.

2—Must be consistent, reproducible, and differentiate between materials of only slightly different qualities.

3—Must be simple and rapid.

Tests such as scribed squares, bend tests, cupping test, and bulge tests are reasonably simple and rapid, but when failures are encountered the above tests must be supplemented to determine the cause. Tensile tests, X-ray, microscopic and chemical analyses, some or all, may be used in any extensive final analysis but are too time consuming and costly for routine testing.

It would be satisfactory and desirable if we had a simple, practical, and not too time consuming and costly method of measuring or evaluating drawing quality material, and the user, thus being in position to specify as desired or as deemed necessary, would then assume responsibility for application and final results of material supplied to his specification. This would be especially desirable in connection with warehouse distribution of material.

The designing engineer and the shop man naturally wish to make a stamping with the minimum number of operations and with the lightest practical material. Probably seldom does the operator in this field of operation need to recognize thinning or thickening of the section or of work hardening that might lead to subsequent cracking, but it may get close to the point of breakage or of maximum reductions in which both the producer and user are interested. And then we encounter that controversial problem whether the material is too light or the draw or stretch too great or the quality not what it ought to be.

The nearest we have come to a measuring stick is by the establishment of the "breakage allowance" practice on the part of the user. Often the design makes necessary heating or stress relieving during or after certain drawing operations in which the producer cannot share any responsibility, but which further complicates the already complicated problem, which we have found from experience.

Chemical Surface Treatments to Aid Drawing

By V. M. Darsey, Parker Rust Proof Co.

Extensive work was done by us, our German licensees, and by Dr. Fritz Singer in Germany on the use of phosphate coatings to facilitate the deep drawing of steel. Today wide use is made of phosphating to reduce friction between the metal and die in the drawing of steel.

Conversion of steel surfaces to a phosphate coating permits more effective and reliable lubrication than possible with uncoated steel. The affinity of the phosphate coatings to absorb oil has long been utilized in corrosion prevention. Phosphate coatings owe their principal usefulness in drawing metal to the fact they provide absorbed lubricant between the work and the die, which is very difficult to squeeze out even under very high pressure, and provide a means of definite mechanical separation between the work and die. Such a combination of chemical coating and lubricant prevents as far as may be possible, metal-to-metal contact under the conditions of temperature and pressure produced in most any given drawing operation. Using SAE No. 20 oil reduced with equal parts by volume with kerosene, the largest diameter of uncoated blank which can be drawn is 5.70 in. using a 2.84 in. punch. Bonderizing the steel made possible an increase in the blank of 3/16 in. to 5.89 in. Calculations show this to represent a reduction in friction of 60 per cent. It is estimated even higher reductions in friction would result from the use of better lubricants in conjunction with the phosphate coating.

In the cold drawing of carbon steel seamless tubing, Bonderizing is widely used. Tubes are immersed in the phosphating bath for two to 10 minutes, water rinsed, followed by a dip in an aqueous emulsion lubricant. The tubes are thus phosphate coated inside as well as outside, and contain a uniform film of lubricant absorbed in the coating. Such processed tubes are drawn at 40 to 100 fpm as compared to 24 to 50 ft for tubes without phosphate coating. Under equivalent drawing conditions phosphate coated tubes are reduced 35 per cent to 45 per cent compared to reductions of 25 per cent to 35 per cent for uncoated tubes. Tests indicate 25 per cent to 50 per cent of the phosphate coating is removed in each draw in tube forming.

In a test, 5000 carbon steel blanks from which hub caps were drawn were Bonderized prior to the forming operation. Without any change in the die set-up or drawing lubricant, they all drew satisfactorily and practically eliminated the appearance of orange peel in the drawn hub caps. The time for metal polishing prior to plating was only one-half that required for polishing uncoated blanks. Scratches were minimized sufficiently that much finer abrasive could be used in the polishing operation.

A new technique in the manufacture of automobile bumpers consists in metal polishing the blanks, Bonderizing and lubricating prior to forming. The phosphate coating and lubricant reduces scratches, preserves the original polished surface, and is said to permit the forming of bumpers with considerably less polishing cost prior to plating.

Salt Bath Heat Treatment as Applied to Automotive Parts

By L. B. Rosseau, Assistant Vice President, Ajax Electric Co., Inc.

A salt bath has characteristics peculiar to itself. First of all since the work immersed in salt is completely sealed from the air, no scaling is possible. Secondly, by suitable chemical control, its effect on the surface of the work can be controlled. It can be carburizing, neutral, oxidizing, reducing, or nitriding as the conditions demand. Thirdly, while capable of extremely rapid heating, roughly one fourth of the normal time, it cannot overheat and the heat shock on loading into the molten salt is reduced. Salts are available to permit operation from 300 F to 2400 F.

What are the qualifications of the salt bath furnace to meet the requirements of the automotive industries?

1—Its extremely high rate of heating permits large production per unit of floor space.

2—The installed cost per unit of production is low, often the lowest available.

3—It provides accurate temperature control. Not only can the furnace easily be held to plus or minus five deg. in any portion of the bath, but furthermore, it is impossible to overheat the work in any way no mat-

(*Turn to page 76, please*)

B-65—Tracer Controlled Milling Machine

Largest capacity Keller machine for automatic electric tracer controlled milling has just been completed at Pratt & Whitney, West Hartford, Conn. This Keller BG 22 is furnished in three capacities—10 ft by 5 ft, 12 ft by 6 ft, and 14 ft by 7 ft. The machines are capable of producing the full range of punches, dies, molds and similar tools required in the automotive, aircraft, Diesel engine, and similar industries. A job may be either profiling in two dimensions or reproduction of impressions and reliefs in three dimensions. Masters may be

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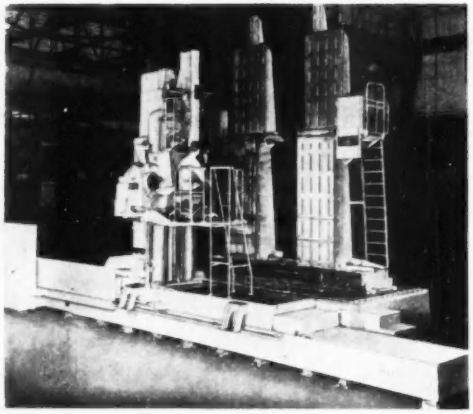


Pratt & Whitney Keller BG-22 machine for automatic electric tracer controlled milling. Die cutting capacity 14 ft by 7 ft.

light metal templates, or on three dimensional work, a solid or built up master of hard metal, plaster, cement, wood, or plastic.

On the new models, the tracer bracket provides three-way adjustment for quick tracer location, positioning being effected through accurate lead screws having micrometer dials, and settings fixed by clamps. An upper platform provides convenient place for the operator when adjusting the tracer and when setting up. Fixed platforms with retractable counterweighted extensions (one on each angle plate fixture) facilitate the setting up of models. At the master operating station platform all controls—including spindle speed-change levers and motion indicators—are concentrated in the spindle head.

Steel platform-type telescoping guards protect bearing surfaces of the bed. Roller mounted, they move on tracks beyond the ends of the main bed. A control cabinet is mounted in permanent position at the left end of the bed.

Rapid traverse rates, both horizontally and vertically, are 250 in. per minute; transverse rapid traverse rate per minute is 140 in. Transverse travel of head is 18 in.; additional transverse spindle adjustment, 6 in. Cutter spindle bore is No. 16; extension adapter bore, No. 12 (both B & S Taper). Spindle speeds designated are 20 to 1200 rpm.

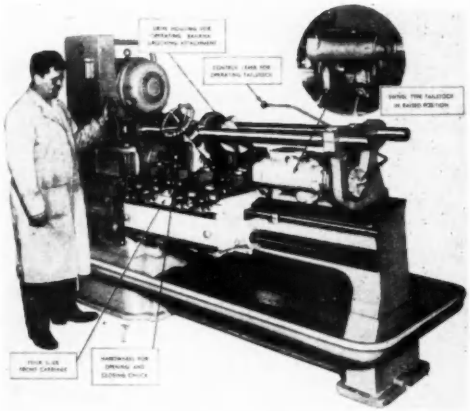
B-66—Automatic Lathe For Camshaft Turning

The model LR center drive Lo-swing automatic lathe of the Seneca Falls Machine Co., Seneca Falls, N. Y., turns and chamfers all bearings, and oil pump gears and cuts interrupted oil or "banana" grooves in a single operation. The lathe is equipped with a two-jaw scroll chuck which clamps and drives the shaft from the cam located adjacent to number three bearing. The chuck jaws are opened and closed with a permanently mounted, gear type, hand wheel shaft. The air operated, swivel type tail-stock is operated with two air cylinders, one of which swings the hinged upper section vertically, to permit easy loading and unloading in a line parallel with the centers, thus eliminating all overhang of the tail-stock center. The second air cylinder controls the movement of the spindle quill. Both movements are controlled by a four-way control valve.

The "banana" grooving attachment is driven and timed from the main drive shaft and imparts a shuttle motion to the grooving tool slide, which is mounted—with other squaring tools—in a block on the rear slide. The driving head swivels on the chuck drive housing and follows the "feed in" and "feed out" movement of the rear slide. The "banana" grooves are always cut in definite relation to the chucked cam on the camshaft.

The machine cycle is as follows: The operator places the camshaft between centers, closes the chuck jaws and operates the spindle starting lever. The front carriage slides and tools advance in rapid traverse to the cutting position and then slow down for normal feed. The squaring, chamfering and grooving tools, mounted on two automatic back squaring attachments, are timed to cut immediately after the front turning tools have ceased cutting. Immediately the rear tools have ceased cutting, all tools and slides are returned to the starting position in rapid traverse. All movements are automatically controlled; the operator simply loads and unloads the parts and operates the starting lever.

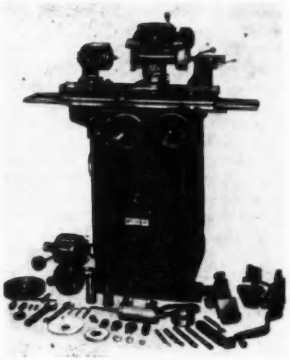
Production at 80 per cent efficiency, is reported to be 80 cam shafts per hour.



Seneca Falls center drive Lo-swing automatic lathe, model LR.

B-67—Universal Cutter and Grinder

Gallmeyer & Livingston Co., Grand Rapids, Mich., features a new small



Gallmeyer & Livingston universal cutter and tool grinder, model 10.

universal cutter and tool grinder—a motor driven model 10 cabinet base machine.

Hand wheel at top of the machine raises and lowers the column and head. Longitudinal movement may be operated by either hand wheel or lever on the front of the machine or by lever in the rear. Cross movement of the saddle is operated from practically any position by means of a hand wheel on the front of the machine and on the rear of the machine.

Graduated dials reading in thousandths are provided for both vertical and transverse movements.

Head of the model 10 may be swivelled through 180 deg and instantly locked at any setting. Table may be swivelled to 90 deg either side of center to provide any relation between table and the grinding wheel spindle.

The grease-sealed ball bearing spindle requires no lubrication for the life of the bearings. The spindle is driven through a vee-belt by a ½ hp ball bearing motor mounted on the head of the machine. Two spindle speeds are provided. Table size is 5 in. by 30 in. Longitudinal table movement is 16 in. Cross movement of wheel is 8 in. and vertical movement of spindle is 8 in.

B-68—Cylinder Block Gaging Machine

Another Precisionaire cylinder block gaging machine has been developed by the Sheffield Corp., Dayton, Ohio, to accurately check each of the bores in V-8 motor blocks at four different points, the operator manually stamping the classification for proper assembly.

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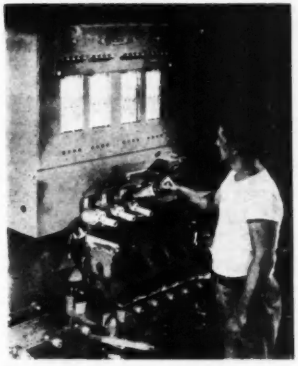
The cylinder block comes directly to the gaging machine on a roller conveyor where it moves into position on a turntable. It is locked in the proper



Sheffield cylinder block gaging machine for V-8 motors.

locating position by hydraulically actuated shot pins. The operator then lowers the four gaging spindles into the cylinder bores by pressing the electrical "down" button to start the inspection operation. Should any of the spindles fail to enter the cylinder bores, a micro-switch stops their downward travel instantly. Signals, one for each spindle, show where interference is being encountered.

Each gaging spindle has four sets of air jets to make four separate checks in each bore. The positions of the floats in the 16 glass tubes indicate if each bore is within specified tolerance limits for taper and dia. By turning a handle directly under the glass tubes, the operator rotates the spindles 180 deg and obtains a full 360 deg check for out-of-round.

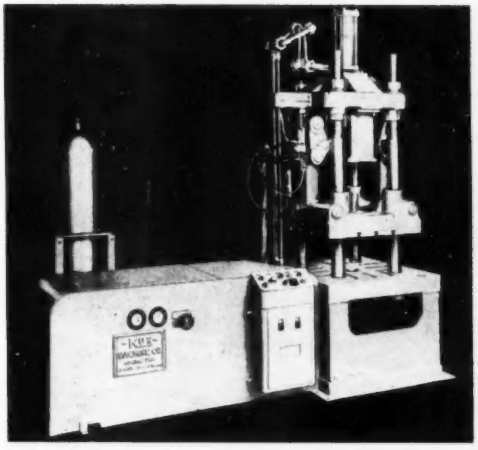
The float position of one designated tube in each group of four indicates the classification in steps of 0.00025 in. The operator stamps this information on the block with symbols, using a manually operated device.

The gaging spindles are then retracted, the turntable is rotated 180 deg and the same procedure is followed to inspect the opposite bank of four cylinder bores. Then the shot pins which lock the block in position are released and it is pushed onto the conveyor line by the next block to be gaged.

B-69—Die Casting Machine

A new cold chamber die casting machine of vertical-type construction is the model HP122, developed by the Kux Machine Co., Chicago, Ill. Designed for the production of parts that have inserts cast in, the machine has its die plates mounted in a horizontal position while its die plates operate in a vertical direction. Thus castings with inserts can be placed in the lower die half without difficulty, and the inserts remain in place all through the die casting cycle without falling out of their cavity placement.

Castings such as electric motor rotors, flywheel and magneto parts hav-



Kux vertical-type die casting machine for production of parts with inserts.

ing magnet inserts, parts with bushings cast in, etc., can now be easily made on this new Kux machine whose vertical design eliminates need for die construction to keep inserts in place.

Hydraulically operated and electrically controlled, model HP-22 has a self-contained hydraulic operating mechanism and will produce castings weighing up to 4½ lb in aluminum. The model has a die space of 17¾ in. square between the bars.

B-70—Special Machine For Rear Axles

LeMaire Tool & Mfg. Co., Dearborn, Mich., has made a special two-way 42-spindle horizontal machine featuring a shuttle fixture to rough and finish bore the large holes, face the ends, drill and ream the bolt holes from the outside and spotface the bolt holes from the inside on a new type rear axle. The axle is for use on an underslung or low clearance type delivery truck.

The machine consists of a fabricated steel center base with two side bases, each of which supports two 5000 lb twin ram units. The center base carries the three-station shuttle-type fixture and a special rear drilling unit used in spotfacing the holes from the inside of the axle ends.

A feature in designing the machine made necessary by the camber of the axle of 1 deg from the horizontal on each wheel mounting surface, has been the angling of all outside units down 1 deg, and a provision for mounting the center rear unit on bars that permit spotfacing at 1 deg up from horizontal when feeding to the left, and also tilts 1 deg up from horizontal in the opposite direction, feeding to right.

For the boring and facing spindles at the front station an auxiliary hydraulic cylinder carries a pilot for the boring tool through the hole to be bored, and enters a pilot bushing. The feed of this unit rough and finish bores the large hole, then bringing into position a special cross facing tool. Continued feed causes single point tools to feed across the face. Three tools do rough, semi-finish and finishing cuts.

Electrical equipment carries the work automatically through the entire machine cycle after the part has been clamped in place and the cycle button is pushed. Axle production is approximately 10 per hour.

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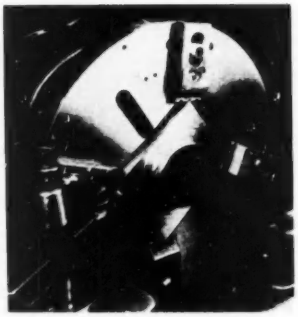
B-71—All-Purpose Jaw Clamps



J & S Tool Co. all-purpose jaw clamps.

An all-purpose jaw clamp, for holding almost every size and shape of work-piece quickly and firmly against the face plate or table of a machine, is presented by the J & S Tool Co., Inc., East Orange, N. J.

No part of the clamp is higher than 15/16 in., making it possible to pass over the whole clamp when holding work 1 in. high or more. The full surface of work ⅜ in. high or over may be machined as illustrated in the photograph because the jaw is only 23/64 in. thick. The clamp facilitates controlled centering adjustment on the clamped work-piece and eliminates secondary operations.

The clamp can be used in machining operations on lathes, planers, milling machines and drill presses, as well as on special production machinery. It can also be used by tool and machine builders. Since the clamp does not protrude above any part of a work-piece over ⅜ in. thick, it cannot interfere with the reading of the indicator dial of vertical boring and milling machines.

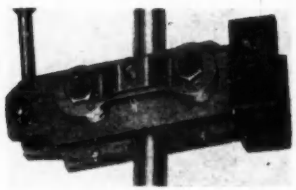
These clamps eliminate different length studs and blockings and there are no separate parts to become lost. There is only one adjusting screw. A 45 deg direction of travel of the jaw holds the work-piece tightly against the face plate. Clamps are tested for two ton down pressure.

B-72—Rod Clamp For Drop Hammer

The Ceco-Drop, new gravity drop hammer of the Chambersburg Engineering Co., Chambersburg, Pa., raises the ram and die, not by the familiar means of boards and rollers, but by a piston and rod operating in a steam or air cylinder. At the top of the stroke the air or steam is exhausted and the ram and die drop by gravity. The method of holding the ram at the top of its stroke is accomplished by an ingenious clamp, basically similar to the familiar broom-handle clamp found in many kitchen closets. This clamp, which comprises two steel blocks supported in a suitable frame, is held in a horizontal position by an air valve when the rod is moving up or down. The rod moves freely between the surfaces of the clamping blocks, but when it is desired to hold the ram at the top of the stroke (or at any point on the down stroke) the clamp drops and the clamping blocks grip the rod instantly, halting all movement. The rod may be released by lifting the clamp to the horizontal position.

Replaceable shoes form the wearing surface between clamping blocks and rod; and an eccentric pivot action is provided to take up the normal wear.

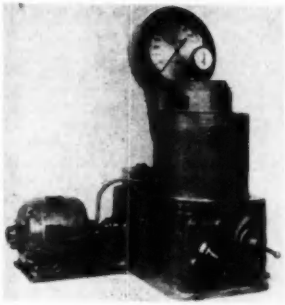
LeMaire Special machine for processing rear axles.



Rod clamp used on new Ceco-Drop gravity drop hammer of the Chambersburg Engineering Co.

C-69—Ductility Testing Machine

Steel City Testing Machines, Inc., Detroit, Mich., announce a new bench model ductility testing machine for testing the drawing qualities of sheet



Steel City bench model ductility testing machine.

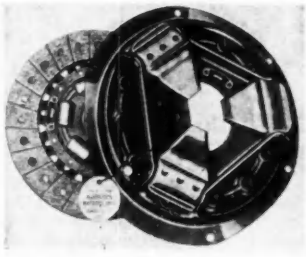
metal. This compact, fast cycle machine, 2 ft 11 in. in height and 26 in. across, has adjustable speed of piston travel by means of a dial setting. Complete tests in as little as 15 seconds are possible. The machine is built with a capacity of 15,000 lbs to cup test material up to ⅛ in. in thickness, or 30,000 lb for material up to ¼ in. in thickness.

The model is motorized and hydraulically operated, incorporating two concentric pistons. Outer piston grips the test piece against the head at the top of the machine while the inner piston makes the cup in the specimen.

An 8½ in. dia pressure gauge, protected against overloading, incorporates a maximum indicating hand to show pressure at which yield in the specimen occurs. Depth indicator shows depth of draw at any moment by direct reading.

C-70—Replacement Clutch

The Auburn Clutch Co., Division of Dana Corp., Auburn, Ind., introduces a replacement clutch for Chevrolet cars



Auburn replacement clutch.

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and light trucks from 1938 through 1948. The new model is a three-lever, adjustable-type clutch constructed on the same basic principles used in all Army Jeep clutches.

Soft pedal action is attained through use of three springs under each lever. Full torque capacity is provided by action of these springs through the lever ratio of the release levers. The pressure springs do not contact the pressure plate or "hot plate" and therefore run cooler.

The plate has six damper spring units around the hub to dampen out vibration and gear rattle. Cushion spring segments between the heavy-duty woven facings are a further feature for smooth engagement.

C-71—Direct Action Shock Asborber

Houdaille "Husky", heavy-duty, direct-action unit added to the line of shock absorbers of the Houdaille-Hershey Corp., Houde Engineering Div., Buffalo, N. Y. Company declares it to be the only heavy-duty, direct-action shock absorber interchangeable with standard-size units and fitting present production installations without sacrifice in collapsed or extended length. Offered for both original equipment installation and for after-market service-sales, changeover of the Husky entails no drilling and no special fittings or brackets.

C-72—Crawler-Type Hand Truck

Means for moving bulky loads to 500 lbs in weight over uneven surfaces is provided in the new Trak-Truk announced by the American Machine Works, Inc., Racine, Wisc.

The Trak-Truk moves on a crawler carriage equipped with continuous rub-

American Machine Works Trak-Truk, crawler-type hand truck with brake.

ber belts. The load is always carried on the belts, no metal ever touching the floor, stairs, pavement or ground. The continuous belts simplify movement of loads up and down steps, and over curbings, ramps, loading platforms and end gates of vans or other motor trucks.

When transporting loads on level surfaces, the Trak-Truk is converted into a "rubber tired" general utility truck by retracting the crawler base. The truck then operates on the lower wheels like any standard two-wheel hand truck, the belts acting as tires.

The two endless rubber belts run over grooved aluminum wheels. Two belt guides have built-in roller supports for the belts. When the truck is loaded, the belts move easily between the guide channels and over the rolls. To maintain correct belt tension, lock-type screws adjust the rear wheels forward or back. Front wheels of the crawler base are provided with automobile expansion-type brakes engaged by a cable pull on the truck handle.

C-73—Fiberglas Top Fabric

A coated Fiberglas top fabric for convertible cars, offered in five colors, is being publicized by Owens-Corning Fiberglas Corp., Toledo, Ohio, and manufactured by the Cordo Chemical Co., Norwalk, Conn. Features of this top material are its washability along with the rest of the car just like a metal top, and the ease oil or grease is removable from it with cleaning fluid. The base fabric is of high tensile strength, woven of Fiberglas yarns

coated with colorful high-solids vinyl. The fabric does not shrink, stretch or fade, and does not crack in winter or become tacky in summer, according to company report. This glass cloth is stated to be flame-proof against carelessly tossed cigarettes.

C-74—Portable Weld-Time Meter

New weld-time meter for measuring the duration of welding current and for checking the schedule set by the welding control, developed by Westinghouse Electric Corp., Pittsburgh, Pa. The unit is a portable direct reading instrument which totals the weld time and gives values in seconds and cycles. A built-in calibrating device eliminates need for a separate source of supply. The device can be built directly on to the welding machine or control and is insensitive to heat control.

C-75—Electric Windshield Wiper

An advanced type of electric windshield wiper, available in 6, 12, and 24-volt models, has been placed on the market by the American Bosch Corp., Springfield, Mass. The complete wiper unit consists of a dual-ended motor assembly as illustrated, two connecting link assemblies, two wiper arm shaft assemblies, a mounting bracket, and a manually operated switch.

The unit provides simultaneous operation of two wiper arms and blades with either tandem or opposed wiping

NEW ★ PRODUCTS

For additional information please use coupon on page 54

motion, with a maximum wiping angle of 118 deg. Parking position is right or left hand for tandem operation; inside or outside for opposed. It has two-speed control—low speed of about 35 cycles per min, high speed of about 60 cycles per min.

With the introduction of curved windshields, it is claimed that blade pressures have increased sharply and require considerable torque for proper operation under adverse conditions. The new motor develops a torque of 30-lb in. at each end in low speed. The device uses unusually low current draw for such high torque performance: For a 6-volt unit, current draw at low speed is about 4.5 amp.; at high speed it draws only 3.5 amp. The manual switch used with the unit provides thermal overload control.

The motor is of DC type, shunt wound and ventilated. Gear drive is from both ends of the armature with a single thread hardened worm af each end. The gear ratio is 62 to 1. An assembly of a parking switch, field resistor, and terminal block is mounted on one gear housing while a terminal block carries three Douglas terminals. The wiper arm shaft assembly carries a spring-loaded clutch set to release at 30-lb in. torque to prevent damage in event of overload.

Two-speed operation is achieved by means of field current reduction for high speed, the resistor on one of the gear housings being switched into the field circuit. The automatic parking switch is connected in parallel with the manual switch when the latter is in "off" position.

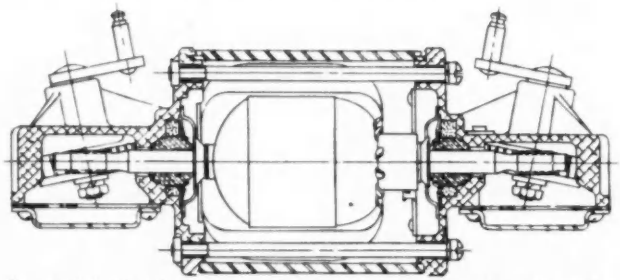
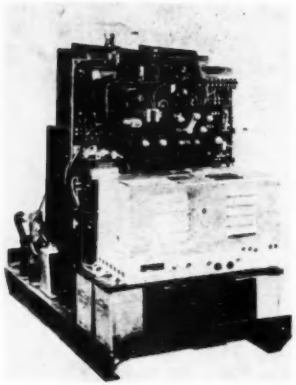


Diagram of American Bosch electric windshield wiper showing dual ended motor assembly

C-76—High Frequency Arc Welder

New high frequency welder for inert gas arc welding, made by National Cylinder Gas Co., Chicago, Ill., is first such type of welder to receive Federal Communications Commission approval. Previous high frequency welders had uncontrolled frequency characteristics,



National Cylinder Gas Co.'s FCC-approved Sureweld Gasarc Welder.

which caused interference with radio communications, the company reports.

The approved NCG unit, employing a tube-type oscillator and a specially designed torch, is "tuned" to preserve freedom from interference while transferring high frequency energy from the oscillator to the welding arc. The torch will remain on the assigned frequency of 27,120 kilocycles regardless of working or weather conditions.

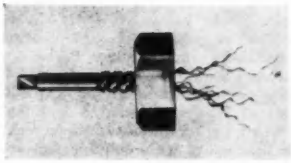
Welding with an arc shielded by inert gases such as helium or argon is used for welding metals such as magnesium, aluminum, copper, bronze, stainless and light gauge steel, and in the production of items ranging from coffee pots to airplanes. The process is significant since for some metals it is the only practical welding method thus far developed.

NCG's new Gasarc oscillator, is a self-contained unit and is a full-wave, self-rectifying type, using a single tube.

The Sureweld Gasarc welder is produced in six models, ranging from 150 to 750 amp in capacity. Its oscillator and "tuned" torch will be available for use with other welders as well.

C-77—Thread Cutting Broach

The shearcutter thread cutting broach offered by the Shearcut Tool Co., Reseda, Calif., generates a perfectly threaded hole by a true broaching action. The chips removed are curled up in one piece and flow out



Shearcut Tool Co.'s new thread cutting broach.

of the hole being threaded, preventing both interference with the cutting action of the broach and breakage due to clogging by the chips.

Design of the tool makes it stronger from a mechanical and engineering standpoint than conventional taps, the company contends, the low torque required to form the thread averaging 50 per cent of that required with a standard tap. The true molecular shearcutting action causes the chip to show no internal structural rupture of its particles. The broach does not bind or or seize the hole being threaded. The broach may be easily resharpened on a tool and cutter grinder by following a finger and rotating the tool as the table is moved.

These thread cutting broaches can be used to replace taps. They may be used in tapping machines, automatics, turret lathes, lathes, or any machine adapted for a tapping operation.

C-78—Combination Speed Reducer

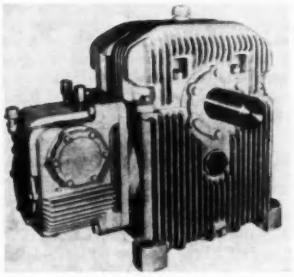
By using standard speed reducers as primaries and secondaries, a new line of double reduction units comprising over 86,000 combinations as to capacity, model and ratio has been made available by the Cone-Drive Division of the Michigan Tool Co., located at Detroit, Mich. The combination of standard reducers provides models with input ratings of from ½ to 68 hp, from 4,000 to 244,000 in.-lbs output torque, and reduction ratios of from 25-to-1 to 4900-to-1. This combination setup of standard units is designed to meet all the operating conditions found in built-to-the-job double reduction reducers.

Only major difference between the standard reducers used in the double reduction units and those supplied for single reduction purposes is that primary gear shafts and secondary pinion shafts are slightly shorter. An adapter plate and flexible coupling connects the two reducers. Additional difference exists in a special housing used for the smallest of the primary reducers.

Individual primary and secondary reducers are interchangeable within given size ranges and may be dismounted and converted to single reduction units, since each component retains its independent lubricant supply and breather. Use of standard gear sets also makes it simple to change the ratio of any combination since all gear sets and bearing mountings are interchangeable for all models of the same size.

NEW ★ PRODUCTS

For additional information please use coupon on page 54



Michigan typical Cone-Drive double reduction speed reducer comprising a standard Cone-Drive 4 in. center distance HV reducer as a primary combined with a standard 8 in. HU reducer used as secondary.

C-79—Machine Tool Air Valve

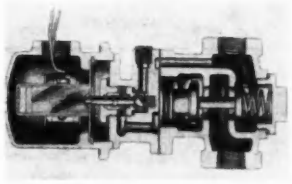
Split-second control of air power on machine tools and similar applications is provided by a new series of "Full-Flo," in-line valves designed by Ross Operating Valve Co., Detroit, Mich.

A variety of sizes are available in both three-way and straightway in-line models. The three-way is used for the control of single acting cylinders and the straightway for instant on-off service of either a plant-wide system or a single coolant line.

The ¼ in. to ¾ in. sizes are pilot type, solenoid operated, with the solenoid releasing the air power which operates the valve. Models can be furnished with inlet ports either normally open or closed. All embody the Ross "Full-Flo" design which provides full pipe size orifices. An oversize exhaust port suits the three-way models to fast reversal. Standard valves handle vacuum as well as air, liquid, or gas pressures to 125 psi; special models can be supplied for use up to 450 psi.

Current consumption is 0.2 amp holding, and 1.2 amp inrush with 110 volt, 60 cycles current. Interchangeable solenoid and pilot sections are used on all sizes of both straightway and three-way types. Moving parts may be inspected without removal of the valve from the line mounting.

For smaller requirements in instantaneous action ⅛ in. direct solenoid operated valves have been designed. Also, 1 in. and 1¼ in. models will be available.



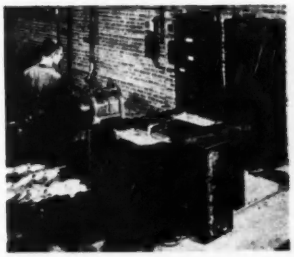
Ross in-line air valve for machine tools

C-80—Channel Flushing Melting Furnace

"Channel Flushing"—a new development in induction melting furnaces—has been announced by the Fisher Furnace Division of Lindberg Engineering Co., Chicago, Ill. This is a further development of the Lindberg-Fisher 2-chamber induction melting furnace announced by the company in 1947. "Channel Flushing" is designed to keep the channels between the two chambers clean and free of slag or oxide accumulations. With it the primary coil of the furnace transformer is so located as to cause a greater volume of molten metal to be impelled into one chamber than into the other. This raises the molten metal level in the one chamber, and lowers the level in the other chamber. Every 60 seconds when the power is cut off, the higher level subsides, and the molten metal flows to the other chamber until the same level exists in both chambers.

When the current is restored, the molten metal is forced in the opposite direction, again causing a higher level in the one chamber than the other.

The furnace control equipment automatically interrupts the power once a minute.



Lindberg-Fisher 2-chamber induction melting furnace using channel flushing.

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

A-96—Mona-Matic Air-Gage Tracer

Monarch Machine Tool Co.—A well-illustrated booklet describes the company's new Mona-Matic "Air-Gage Tracer" controlled automatic cycle production machine for single-point metal turning. Examples of typical Mona-Matic performance are given together with speed and feed charts for the machine.

A-97—Automotive Sealers

Presstite Engineering Co., Automotive Sealer Div.—A new 1949 catalog of sealers features materials that provide maximum sealing at minimum costs. A variety of special sealers for specific requirements made necessary by the latest changes and improvements in the design and production of automobiles, bus and trailer bodies, refrigerated truck bodies is presented. Dealers described in the catalog are windshield sealers, special body sealers, fender sealers, spotweld sealers, extruded elastic compound tape, etc.

A-98—Press Brakes

Verson Allsteel Press Co.—Bulletin JIB-49 describes the company's lines of Junior and Intermediate Press Brakes. Complete design details and specifications are given.

A-99—Expanded Metal

Joseph T. Ryerson & Son, Inc.—A new 8-page bulletin gives engineering data, including load deflection, air flow comparison and free openings, of both standard and flattened mesh types of expanded steel. Included also is a list of sizes with dimensions and weights, illustrations of mesh and typical applications, and data on Expanded Metal Grating.

A-100—Hydraulic Cylindrical Grinder

Landis Tool Co.—A new catalog describes and illustrates the Landis Tool 4" Type H Plain Hydraulic Cylindrical Grinder. Included in the 16-page catalog are many illustrations of the machine, its parts, grinding set-ups and extra attachments. Complete specifications are also included.

A-101—Battery Technology

Gould Storage Battery Corp.—The company has made available a 40-page pocket-size handbook of instructions and engineering data on the care of motive-power batteries. It is divided into four sections: Care and Operation; Maintenance and Repairs; Parts; and Technical Data. It is prefaced by two double-page spreads giving exploded views of the tape-insulated and mat-insulated types of batteries currently used. Each part of the battery is clearly shown in relation to the others, and is keyed to descriptive text and instructions which follow. The Parts section lists battery parts, and catalogs Gould battery tools for maintaining and repairing batteries, gives illustrations, line drawings, tables and instructions on how correctly to order battery parts.

A-102—Straddle Truck

Hyster Co.—A 16-page catalog describes the revised Model M straddle truck with its numerous improvements in engineering and design. Greater capacity and greater visibility for the operator are two of the important features of the new machine. Model views and operational photographs showing the truck carrying a variety of materials and other unit packages provide an idea of the design and capabilities of the machine.

A-103—Mounted Wheels and Points

Simmonds Abrasive Co.—The versatility of mounted wheels and points for offhand and precision work and for grinding in hard to reach places is described in a new folder. It shows full size illustrations of these products together with suggested uses and pre-

(*Turn to page* 56, *please*)

TIME SAVER COUPON for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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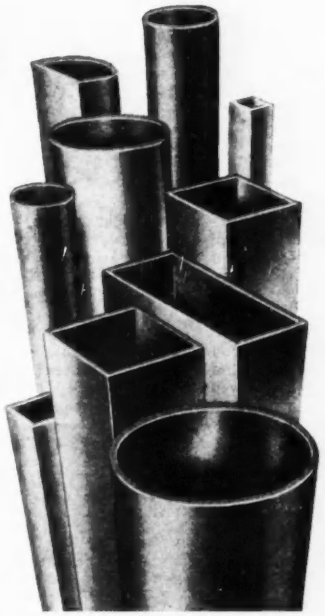

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sents the wide range of sizes available. Also included is information on grains, grades, operating speeds and a section giving four easily followed rules for ordering the desired wheels and points.

A-104—Sintered Iron Bearings

Bound Brook Oil-Less Bearing Co.—Size List No. 21 contains a complete listing of all the types and sizes of porous bronze and sintered iron bearings which can be made from dies on hand, without tooling charge. In addition, this handy 24-page reference book for engineers, designers and purchasing agents contains information on bearing metal formulae, tolerances and other data.

A-105—Controlled Air-Power Devices

The Bellows Co. — Bulletin CL-15 gives a brief description of the products included in the company's complete line of pneumatic devices, Air-powered feeds, air-powered vises, collet chucks, rotary feed tables, air-powered presses, cylinders and valves.

A-106—Power Liftrucks

The Revolvator Co.—An attractive, informative bulletin, No. 166, describes four low cost Revolvator power liftrucks of the new Go-Getter series. The folder includes dimension drawings of the liftrucks.

A-107—Tailor-Made Irons

Frank Foundries Corp.—The attractive 50th Anniversary booklet produced by the company gives detailed information and photographs on the possibilities and uses of electric furnace-made alloyed tailor-made gray irons.

A-108—Blowers

Lindberg Engineering Co.—Bulletin No. 740 gives construction details, features, and diagrammatic drawings of the Lindberg-Fisher blowers. A table of sizes and specifications is included.

A-109—Thermostatic Bimetal

W. M. Chace Co.—A new catalog released by the company contains information regarding the Thermostatic Bimetals produced by it and is intended to help the design or product engineer select the type and size of thermostatic bimetal element best suited for use in his temperature responsive device. Information on the applications, typical bimetal elements, testing devices, tables of properties, etc., are included.

A-110—Galvanic Cell Corrosion

International Nickel Co., Inc.—A new booklet, recently issued, contains reasons for galvanic cell corrosion, as well as methods for helpng to overcome it. The booklet is complete in engineering details and includes drawings and other essential illustrative material.

A-111—Silicone Rubber

General Electric Co.—A 24-page illustrated bulletin, No. CDP-584, describes G-E silicone rubber. It is devoted to the heat resistant, mechanical, electrical and chemical resistant properties of G-E silicone rubber, as well as applications for the material. It also contains a discussion of fundamentals of silicone chemistry and the performance of the rubber under varied conditions. Property tables are included for reference.

A-112—Electro-Galvanized Products

Republic Steel Corp.—Form ADV-525 contains pertinent information on the welding, soldering, cleaning, painting and fabrication of electro zinc-plated sheets, tells how the use of these products can save time and money, and pictures numerous current applications. Included in the booklet is a diagram illustrating the various steps in the electroplating process and data on gages and sizes and base metals available.

Automobile Industries of France and Italy to Unite

By W. F. Bradley, Special European Correspondent of Automotive Industries

THE Franco-Italian customs union, the principles of which have already been signed, will eventually make the automobile industries of the two countries into one unit. Since 1924 there has been a watertight bulkhead between them, for maximum tariffs made it prohibitive to bring Italian cars into France or to export French automobiles into Italy. It is expected that six years will elapse before the customs union has reached complete application.

Just how the scheme will work out is not quite clear, for although French and Italian industrial leaders have had conferences, definite conclusions have not yet been reached. In French circles the opinion exists that Italy will benefit more by this union, for the French market offers much greater possibilities than that of Italy. Now the Italians are handicapped by their production costs, but this situation will change when it becomes possible for Italian manufacturers to purchase certain raw materials on the French market.

At the present time the yearly production of the two countries is 258,000 vehicles. Last year France built 198,372 passenger cars and trucks, while Italian output was 59,765 vehicles composed of 44,221 passenger cars, 9,591 light trucks, 4183 heavy trucks, and 1770 buses and coaches. Exports were 11,477 passenger cars and 2659 other vehicles. Production increased by 36.8 per cent in the year and exports increased 24 per cent.

Italy, however, is still far from her maximum production, for while all buildings damaged or destroyed during the war have been re-erected, much new plant is required. Fiat holds the leading position with a production of 300 passenger cars per day, in addition to trucks, tractors, diesel engines, marine units, railroad equipment, domestic appliances, etc. The others of importance are Lancia and Alfa Romeo, both producing passenger cars and trucks; O.M. on trucks only; Isotta Fraschini on trucks and coaches, with passenger cars coming along and Caproni with a passenger car program. In addition there are several smaller firms specializing in racing and sporting cars—Ferrari, Maserati, Cisitalia.

When the tariff war was at its height, about 1924, Fiat opened an assembly plant in France, then took over the Donnet factory and formed the Simca company which built passenger cars under Fiat license. This company has become the fourth biggest producer in France, following Citroen, Renault and Peugeot and preceding Ford. While Fiat still has some holdings in Simca, the latter firm is no longer under an obligation to build under Fiat license and may design its own cars. It is known that Fiat has new models in preparation, but whether these will be built in France or not is uncertain.

Lancia followed Fiat's example and opened an assembly plant in France, but this was not continued. Under the Union there is a possibility of Fiat coming again on the French market and thus being in competition with the firm it helped to establish there.

Italy's technical contribution to the French automobile industry has been important. Three chief engineers of leading firms are of Italian origin and there are a number of experts from over the border. Italian mechanics always have been welcomed. The movement in the opposite direction has been slight. In the tire industry Michelin has a factory in Italy, but no Italian tire manufacturers produce or sell in France.

The general opinion is that the union will be highly beneficial to the automobile industries of both countries.

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The Vickers Sectional Type Multiple-Unit Valve, available in many combinations for operating single- or double-acting cylinders, provides convenient and selective control. Ask for Bulletin 40-13.

Vickers Balanced Vane Pumps are outstanding for their long life and efficient operation. Their exclusive hydraulic balance construction entirely eliminates pressure-induced bearing loads and resulting wear. Longer life and less hydraulic slip are insured at maximum operating pressures. Ask for Bulletins 36-12 and 49-52.

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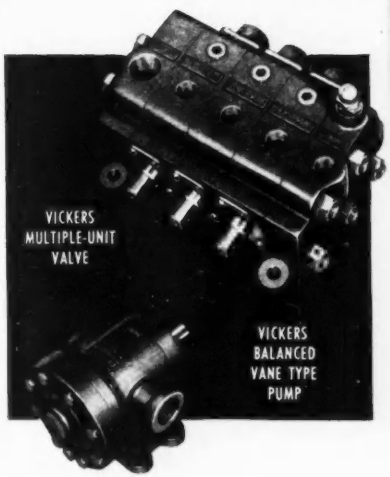

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PERSONALS

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

General Motors Corp. — **Russell L. Hibbard** has been appointed Director of Unemployment Compensation activities, on the Central Office Personnel Staff.

Ford Motor Co.—Announcement has been made of the appointment of **George S. Coats** as Dearborn District Sales Manager. **A. D. Hardenbrook** has been appointed manager of the distribution department, Ford Division. He succeeds **L. V. Brown** who recently retired.

Ford International, Inc., Subsidiary of Ford Motor Co.—The appointments of **Harold E. Jones** as Vice-President of Supply and **A. C. Moore** as Vice-President of Manufacturing have been announced.

The International Nickel Co. of Canada—**Dr. John F. Thompson,** who has been Executive Cice-President, was elected President of the company. **Dr. Paul D. Mercia** succeeds Dr. Thompson as Executive Vice-President.

Bendix Aviation Corp.—The election of **George E. Stoll** and **Lawrence A. Hyland** as Vice-Presidents has been announced. Mr. Stoll is General Manager of the Bendix Products Division at South Bend. Mr. Hyland, formerly Executive Engineer of the Company, will be in charge of Bendix Aviation research.

Willys-Overland Motors—**Walter F. Benning** has been appointed Chief Engineer and **Philip C. Johnson** has been appointed Assistant Chief Engineer.

Fuller Manufacturing Co. — The Transmission Div. has announced the following appointments: **J. A. Packard,** Manager of Original Equipment Sales; **L. C. Butler,** Manager, Service Sales and **B. S. Tooker,** Service Manager.

Lyon-Raymond Corp. — **George G. Raymond, Jr.,** Sales Manager, has been elected to the office of Vice-President. In addition to his new duties, Mr. Raymond will continue as Sales Manager.

Goodyear Tire & Rubber Co.—**J. G. Nield,** Service Representative, has completed 35 years' service with the company.

The Parker Appliance Co.—**Frank A. Depatie** has been named manager of the newlp established Service Department.

Allegheny Ludlum Steel Corp.—The resignation of **Melvin C. Harris,** as Vice-President in charge of Production has been announced. Pending election of a successor, **C. B. Pollock,** Production Manager, will be in charge of production for the company.

United States Rubber Co.—**William M. Dougherty** was elected Secretary of the company to succeed the late **Eric Burkman. G. Roger McNear** has been appointed assistant to **Harry E. Humphreys, Jr.,** President. Mr. McNear succeeds Mr. Dougherty.

American Brake Shoe Co.—**George N. Decker** has been made Comptroller of the Kellogg Div. of the company.

Hyster Co.—The appointment of **Alfred I. Stuart** as head of the Methods Engineering Dept., has been announced.

A. E. Bausenbach Organization, Inc. —**H. Eugene Johnson** has been made Executive Engineer.

United Aircraft Corp., Pratt & Whitney Aircraft Div.—**Donald H. Culver** will assume the post of divisional auditor. Mr. Culver succeeds the late **Frank C. Redfield.**

Aviation Maintenance Corp. — **Stan Wilson** has been appointed General Sales Manager.

Bell Aircraft Corp.—Announcement of the resignation of **David E. Postle** has been made.

Pennsylvania Salt Mfg. Co.—**Leonard T. Beale,** President, was re-elected a member of the National Industrial Conference Board.

Reeves Brothers—The appointment of **Charles F. Schroeder** to the newly created office of Advertising Promotion Manager, has been announced.

General Box Co.—**Edward Wagner,** President of W. T. Wagner's Sons Co. of Cincinnati, was elected a Director of General Box. Four new vice-presidents were elected as follows: **F. J. McGraw, H. B. O'Donnell, T. W. Regan** and **George T. Walne**.

The Mengel Co.—**Bruce A. Dean** has been appointed General Sales Manager of the Plywood Div.

Inter-Industry Highway Safety Committee—**J. E. Wolfington** has been named to the Inter-Industry Highway Safety Committee.

The Leece-Neville Co.—**Harold J. Zuske** has been appointed to head the original equipment sales div.

York Corrugating Co.—**John T. Robertson** was elected to succeed the late **John A. Grass** as President of the company. Other officers elected are **Gordon L. Reed,** Vice-President in charge of engineering; **Raymond E. Wentzler,** Vice-President in charge of manufacturing; **Lawson E. Wentzler,** Vice-President in charge of wholesale div.; **Sterling W. Kohler,** Secretary-Treasurer; **Paul Z. Kistler,** Asst. Secretary, and **Ross E. Hopple,** Asst. Treasurer.

Necrology

David R. Wilson, 74, former president of Willys-Overland Motors, Inc. and co-founder of one of the world's largest gray iron foundries, died in Pontiac, Mich., on March 11.

Myer D. Maremont, 77, chairman of the board of directors, Maremont Automotive Products, Inc., Chicago, died on March 8.

A. Atwater Kent, 75, radio and automotive electrical equipment manufacturer, died recently in Los Angeles.

John J. Carter, 62, retired manufacturing manager of GM's Oldsmobile Div. and member of GM's executive staff, died in Lansing, Mich., on March 9.

John M. Jerpe, 58, suggestion plan director, General Motors Corp., died on March 10 in Indianapolis.

Alvin B. Einig, 64, general manager and director, Motch & Merryweather Machinery Co., Cleveland, O., died Feb. 27, in Cleveland.

Walter Rufus Howell, 60, president, Bliss & Laughlin, Inc., Harvey, Ill., died in Chicago on March 15.

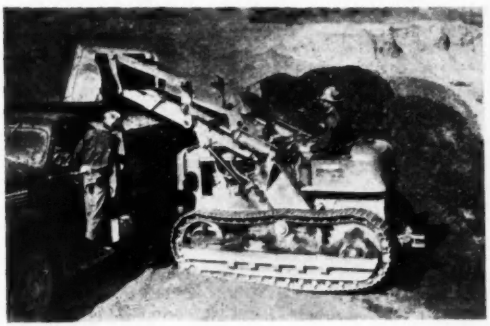
Raymond E. Hall, 52, general superintendent of the overall operations of Kellogg Manufacturing Co., a division of the American Shoe Brake Co., died March 12, in Rochester, N. Y.

Light Alloy Radiators for Racing Cars

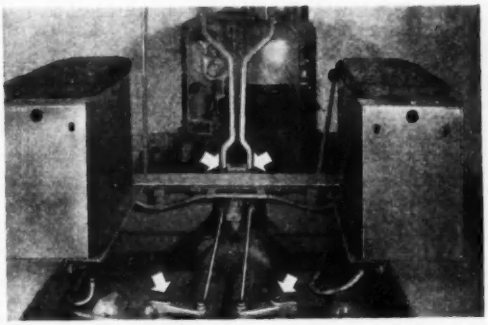
A process for the production of aluminum radiators for automobiles is being developed by Delaney Gallay, Ltd., Cricklewood, London. The technique is similar to furnaces brazing in which the parts to be joined are assembled with a coating of a metal with a lower melting point and raised to a temperature which causes the brazing metal to flow into the joints according to *The Autocar*, London. After much experimenting a suitable coating method is said to have been evolved for aluminum.

Special sheet aluminum, thinly coated with a silicon alloy, is used for the radiator matrix. Parts are clamped in place and then heated in a furnace. Accurate control of temperature in the furnace is extremely important as the melting point of the aluminum is only 10C above that of the silicon alloy coating.

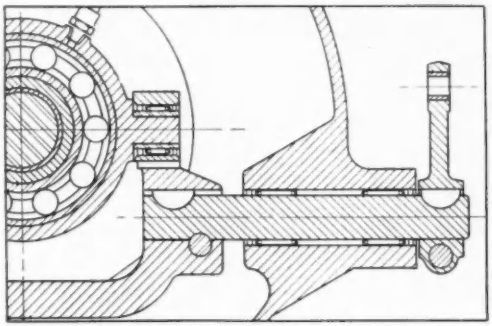
Torrington Needle Bearings Help Make Allis-Chalmers HD-5 Diesel Tractors Easier to Operate and Maintain



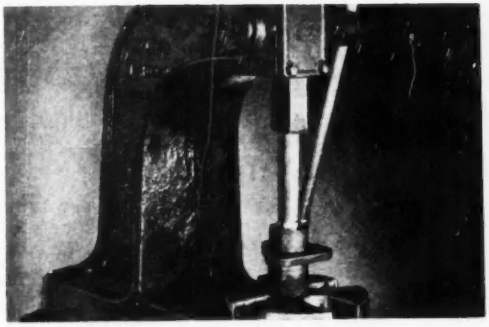
The HD-5 Diesel Tractor is a smaller machine built by Allis-Chalmers Manufacturing Company with big tractor stamina and performance. Among features assuring easy operation and maintenance are 15 Torrington Needle Bearings.



Steering effort is reduced, for example, by the smooth operation of efficient Needle Bearings in the steering clutch controls. Two Needle Bearings are used on each operating lever, and two on each intermediate lever shaft.

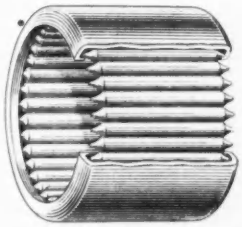


Unusually compact design of the engine clutch control is secured with seven Needle Bearings, three of which are shown in the cross-section above. Grease-packed at assembly, Needle Bearings need little further attention.



Easy installation by a simple arbor press operation is a Needle Bearing feature that helps keep assembly costs low. The design of these compact units also simplifies fabrication and assembly of related parts.

You too, can secure smooth operation and low maintenance costs, with economies in production, by using Torrington Needle Bearings. Let our engineers help you to adapt them to your product requirements. Call or write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers

General News

(*Continued from page 23*)

buretor is bolted up direct to the supercharger casting. The non-supercharged model has a compression ratio of 11 to 1, and is said to develop 155 hp at 7000 rpm.

Although the Ferrari will not be entered in the Indianapolis 500 mile race, Don Lee will enter his Offenhauser which finished fifth in 1948. Mack Hellings will be the driver. The car will have its wheelbase lengthened from 96 in. to 100 in. and will be provided with a 52-gal fuel tank instead of the 31-gal tank formerly used.

Cornell Air Lab Sales Top $3 Million in Fiscal '48

Terming its operations "successful," Dr. Clifford C. Furnas, executive vice president of the Cornell Aeronautical Laboratory Inc., has said that the Buffalo laboratory had "sales" amounting to $3,182,103 in its fiscal year ended last June 30. This compared with "sales" of $3,310,079 in the 1946-47 fiscal year.

For the most part, "sales" of the laboratory constitute research contracts for research projects from the Army, Navy and Air Force, and from aviation companies and other industries. The laboratory's financial statement showed a "balance of income over expenses" of $33,367 for the 11 months ended May 31.

In his annual report to directors, Dr. Furnas said that the laboratory in the last fiscal year increased its spending on exploratory or basic internal research to $58,534 from $39,355 in the previous year.

"This overall program of internal research," he declared, "is one of the most important aspects of the laboratory's entire operation. It provides a stimulus to our scientists over and above their daily work which is, in the majority of cases, applied research.

"It represents a certain freedom for exploratory thinking because it is not bound by a contract or purchase order. Therefore, in our best judgment, the fruits of today's internal research will become the customers' requirements of tomorrow.

Dr. Furnas pointed out that the greater part of the laboratory's technical program comes under Government security regulations and cannot be disclosed. He did say that the laboratory has developed a new type of helicopter rotor blades of resin-impregnated fiber glass cloth built around Balsa cores, and that these have been successfully whirl-tested at Wright Field, O. He also said that the laboratory has a comprehensive program on "aero-elastic phenomena," which are "of increasing severity and importance in high speed flight."

"Aircraft in flight show a whole series of transitory phenomena in the form of a variety of oscillations which are not yet completely understood or predictable. Our Flight Research Dept. has devised techniques and methods of interpreting results which are significant in solving the problems of so-called 'dynamic stability and control.'

"Part of this program involves flight research on the jet airplane, the F-80, or Shooting Star. The Aero-Mechanics Dept. has been conducting theoretical and experimental work on the aero-elastic phenomenon of 'flutter.' Important new data have been obtained which should be of great value in the design of high-speed aircraft."

Dr. Furnas said that possibly the most important and significant item in the year's progress was the starting of successful subsonic wind tunnel operations. Contract work on testing models has been carried on in the wind tunnel since last March, he added.

Correction to Cadillac Bore Dimension

We regret that the bore of the Cadillac engines shown on page 123 of the 1949 Statistical Issue of AUTOMOTIVE INDUSTRIES, published March, 15, 1949, is incorrectly shown as 3 3/16 in. The correct dimension should be 3 13/16 in.

ENGINE SPEED CONTROL
MILES-PER-HOUR RESTRICTION
OVER-SPEED PROTECTION
PIERCE
GOVERNORS
your guarantee of satisfactory engine performance and protection
Pierce is one of the world's largest governor manufacturers —offering more than 3,000 different assemblies of Pierce Precision Governors, Pierce Servo Governors and Pierce Road-Speed Governors for gas, gasoline and diesel engines.
SERVICE AND REPLACEMENT PARTS FOR PIERCE GOVERNORS AVAILABLE THROUGH PIERCE DISTRIBUTORS IN ALL PRINCIPAL CITIES
THE PIERCE GOVERNOR CO., INC. • 1615 OHIO AVE. • ANDERSON, INDIANA

No Spoilage in Production...

No Spoilage of Sales...

*"TROPITAN" Furniture by Rifts Co., Los Angeles, Cal.

...when AMERICAN PHILLIPS SCREWS are used to fasten fine furniture like this*

"EASY CHAIRS" TO BUILD: Take a look at this handsome living room. How would *you* like to try building furniture like *that*, with wobbly screws and slipping, slashing drivers? Well, neither would the builders of this visibly top-quality line. So they play safe. They use American Phillips Screws *instead of binding the frame together*, . . . and haven't a worry in the world about cost, spoilage, or complications in production. In fact, they guarantee the frame for life.

"EASY CHAIRS" TO SELL: Nor do they have any worry about their ultra-modern designs being spoiled by old-fashioned, ugly, slotted screws . . . nor about any burred screwheads left to injure customers and clothes and spoil repeat sales. For against all these former threats, they now have American Phillips Protection at every fastening point. Now, how about *you?* What fastening worries do *you* have? *Write.*

American Screw Co., Providence 1, R. I.; Chicago 11: 589 E. Illinois St.; Detroit 2: 502 Stephenson Bldg.

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Tooling for Volume

(*Continued from page 35*)

quiring precise maintenance of size and axial alignment as well.

In this set-up bores are held to 3.280-3.281 in.; centers of the two bores are held to 4.6865-4.6895 in.; while the distance between bulkheads runs 10.780-10.790 in.

Another example shows the extent to which Detroit Gear has tooled the job to assure accuracy of mounting at final assembly. A big horizontal W. F. & John Barnes two-way machine is used to ream two dowel holes in the front bolt circle of the transmission case, and two dowel holes in the rear of the case. In each instance the reaming is done in previously drilled holes. The two holes in front are for alignment with the engine; the two at the rear for alignment with the rear axle. The machine is large and massive and the telescoping pilot bars which come in from both ends are unusually heavy and rigid. At the start of the cycle the bars come into position and telescope before the reamers come into play.

Transmissions and rear axles are assembled on individual power driven assembly conveyors. Following assembly, the transmissions are routed to the sound booth where each unit is run through a complete schedule of going through the gears as well as reverse, at idling and at load, with the inspector alerted for ease of shifting and quietness. These transmissions must be quiet to be acceptable in Ferguson tractors.

In similar fashion the rear axles are checked 100 per cent in the test machine illustrated here. When installed in the fixture, the axle is driven from an overhead drive and checked for quiet running. At the same time the axle is filled with lubricant so the operator can observe whether or not the oil seals are tight under running conditions.

Highest stabilized degreasing solvent

—Stabilized NOT Alkalized

Years of research and development have produced this outstanding new BLACOSOLV. This new product has been subjected to the most rigorous stability tests for the most difficult jobs. Contains no alkaline materials which neutralize acid *after* breakdown. The new stabilizers *prevent* solvent breakdown and possible acid formation.

The new BLACOSOLV will degrease scientifically all metals or combinations of metals. You need not pay premium prices for special solvents for different metals. Blacosolv can be used over and over without impairing its high qualities.

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NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE & CO.

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

CALENDAR

Conventions and Meetings

Natl. Std. Parts Assn., Regional Business Mtg., Dallas ..... April 4
Metal Powder Assoc. Annual Mtg. & Exhibit, Chicago ..... April 5-6
Amer. Inst. Elec. Eng. Conf., Buffalo ..... April 11-12
Amer. Soc. of Lubrication Eng. Annual Show & Convention, New York ..... April 11-13
SAE Aeronautic Mtg., New York City ..... April 11-13
Amer. Soc. of Metals, Western Metal Congress, Los Angeles ..... April 11-16
Midwest Power Conference, Annual Meeting, Chicago ..... April 18-20
Magnesium Association Annual Meeting, Chicago ..... April 19-20
Machine Tool Electrification Forum (Westinghouse), Buffalo ..... April 26-27
Salon International DeL' Aeronautique, Paris ..... April 29-May 15
Automobile Old Timers Annual Luncheon, New York City ..... April 28
Chamber of Commerce of the United States Annual Mtg., Washington ..... May 2-5
British Industries Fair, London ..... May 2-13
Natl. Std. Parts Assn., Regional Business Mtg., Atlanta ..... May 9
Amer. Management Assoc. Nat'l Packaging Exp., Atlantic City ..... May 10-13
Instrument Soc. of America, Annual Mtg., Toronto, Can. ..... May 12-13
Soc. for Experimental Stress Analysis Mtg., Detroit ..... May 19-21
Auto. Eng. Rebuilders Assoc. Annual Convention, Baltimore, Md. ..... May 19-21
Natl. Std. Parts Assn., Regional Business Mtg., Philadelphia ..... May 22
Middle Atlantic Regional Automotive Show, Phila. ..... May 23-30
SAE Summer Mtg., French Lick ..... June 5-10
Phila. Auto Trade Assoc. Show, Phila. ..... June 11-18
American Inst. of Elec. Engineers, Swampscott, Mass. ..... June 20-24
Amer. Soc. for Testing Materials Annual Mtg., Atlantic City ..... June 27-July 1
Amer. Electroplater's Soc. Annual Convention, Milwaukee ..... June 27-30
SAE West Coast Mtg., Portland ..... Aug. 15-17
Canadian Nat'l Aircraft Exhibition, Toronto ..... Aug. 26-Sept. 10
Instrument Soc. of America Convention, St. Louis ..... Sept. 12-16
Inst. of Traffic Engineers, Washington, D. C. ..... Sept. 25-28
Society of Industrial Packaging and Materials Handling Engineers Annual Exposition, Detroit ..... Oct. 4-7

VICTOR announces VIC-2-BEAD

TRADE MARK

the first successful development* of dual-beaded thin metal gasket design . . .

***Compressed thickness to .020 Fully effective on L-head and Valve-in-head engines**

For the higher compression ratios of today and tomorrow—Victor, the sealing products leader, offers this highly efficient solution to head gasket problems. Already accepted by the automotive industry, the VIC-2-BEAD principle introduces new standards of performance and economy in engine head sealing.

While others said it couldn't be done, Victor claims these distinct advantages for VIC-2-BEAD:

1. Highly effective performance in both L-head and valve-in-head engines with a double-beaded thin metal gasket.
2. Basic compressed thickness of .020 maintained within close limits.
3. Concentration of sealing forces at compression and coolant openings, with maximum seal retention by means of the wave spring action of dual-bead design.
4. Maximum sealing with minimum cylinder wall distortion.
5. Reduction of torque loss on cap screws or studs.
6. Elimination of usual retightening operation after engine warm-up, while sealing with current specified torque loads on cap screws or studs.
7. VIC-2-BEAD gaskets can be used in tandem to increase combustion volume where proper fuel is not available.

Technical data on request

Designers will find outstanding values in VIC-2-BEAD sealing for all types of internal combustion engines. Complete technical data promptly submitted on request. Victor Mfg. & Gasket Co., P. O. Box 1333, Chicago 90, Ill.

Section across combustion openings, also showing how beading is precisely blended at coolant openings.

Sealing with VIC-2-BEAD does not depend on contact with flat surface of the gasket. Seal is made by the embossed dual-beading around all combustion and coolant openings, and fully retained by the wave spring action of the beading when compressed. Sealing forces are concentrated where needed most, without danger of cylinder wall distortion. Once studs or cap screws are tightened to specified torque, retightening is unnecessary due to this live sealing action from within.

Manufacturers of **SEALING PRODUCTS** *Exclusively*

VICTOR

GASKETS · · OIL SEALS

VICTOR GASKETS AND OIL SEALS

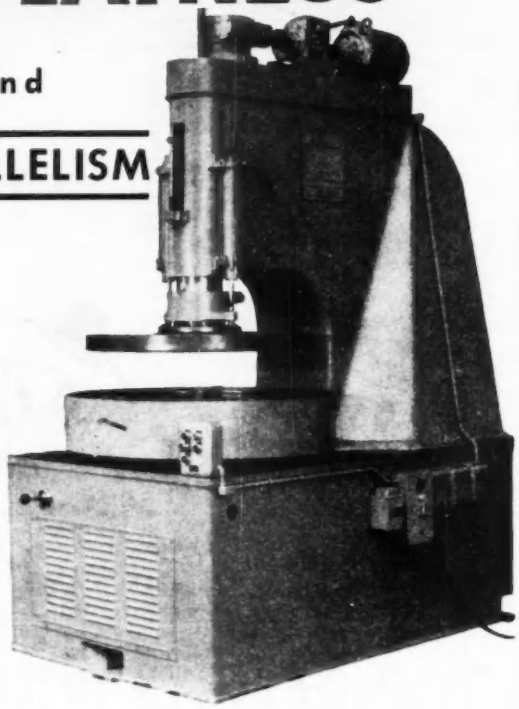
The Greatest Name in the Gasket Industry

Productively Generate

SURFACE FLATNESS

and

PARALLELISM



24 sets—48 parts—of these hardened Gerator pump gears are finished simultaneously on a Model 844-2 MICROFLAT machine. The surface is optically flat and parallel within 0.0001 inches. Production is approximately 1200 parts per hour.

Double Surface MICROFLAT machines provide a high production method of generating parallelism between two opposite faces of a part, in one operation. This is accomplished by mounting a number of parts in fixtures which rotate about their own centers while turning around a pivot gear. Lapping plates, above and below the fixtures, revolve in opposite directions about the common center. This assures that every point on each surface will be abraded by the full area of the plate. Loose abrasive is automatically applied to the plates. The operation of these machines is simple and the results are consistently accurate.

DISTRICT FIELD OFFICES:

1323 S. Santa Fe, Los Angeles 21, California
616 Empire Bldg., 206 S. Main St., Rockford, Ill.
55 George St., Brantford, Ont., Canada
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

Business activity in general declined further during the week ended Mar. 5. Electric power production, crude oil output and bituminous coal production were lower than in the preceding week, while department store sales, railway freight loadings and construction increased. The *New York Times* index of activity for the week ended Mar. 5 stands at 146.7, as compared with 148.2 in the preceding week and 151.7 a year ago.

Sales of department stores during the week ended Mar. 5, as reported by the Federal Reserve Board, equaled 243 per cent of the 1935-39 average, as compared with 232 in the week before. Sales were nine per cent below the corresponding distribution a year ago, as against a preceding decrease of seven per cent. The total in 1949 so far reported is two per cent less than the comparable sum in 1948.

Electric power production during the same period declined to the lowest level reached this year. The output was 4.9 per cent above the corresponding amount in 1948, as compared with a similar advance of 5.9 per cent shown for the preceding week.

Railway freight loadings during the week ended Mar. 5 totaled 705,552 cars, 2.5 per cent more than the figure for the week before, but 10.9 per cent below the corresponding number recorded in 1948.

Crude oil production in the same week averaged 5,186,800 bbl daily, 157,450 bbl less than in the preceding week and 166,100 bbl below the comparable output in 1948.

Production of bituminous coal and lignite during the week ended Mar. 5 is estimated at 10,330,000 net tons, five per cent less than the output in the week before and 16.6 per cent below the corresponding quantity in 1948.

Civil engineering construction volume reported for the week ended Mar. 10, according to the *Engineering News-Record*, was $184,579,000, 56 per cent more than the preceding weekly figure and 92 per cent above the comparable sum in 1948. The total recorded for 10 weeks of this year was 32 per cent more than the corresponding amount in 1948.

The wholesale price index of the Bureau of Labor Statistics during the week ended Mar. 8 advanced to 159.9 per cent of the 1926 average. The index was 0.1 per cent higher than in the preceding week but 1.2 per cent less than the corresponding figure in 1948. Prices of farm products increased slightly, while the general level of other commodity prices remained unchanged. A decline of two cents per pound in the price of lead, however, marked the first reduction in major non-ferrous metals since the lifting of controls in 1946.

Member bank reserve balances decreased $260 million during the week ended Mar. 9. Underlying changes thus reflected include an increase of $20 million in money in circulation, accompanied by decreases of $166 million in Treasury deposits with Federal Reserve banks and $419 million in Reserve bank credit.

Total loans and investments of reporting member banks increased $30 million during the week ended Mar. 2. A decline of $75 million in commercial, industrial, and agricultural loans was recorded.

1ST STANDARD EQUIPMENT CHOICE

OF LEADING CAR, TRUCK AND TRACTOR MANUFACTURERS!

Test it! Compare it! That's all we ask. That's all you'll need to do to know why the Aetna T Type Clutch Release Bearing has been breaking performance and volume records throughout its 18 year history — why it enjoys the pronounced and uninterrupted preference of more than 50% of motordom's clutch release bearing users. May we send a sample for test?

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NOS. 1,958,725 & 2,140,818
Oil-filled bronze retainer locks raceways in permanently true alignment, ends the noise, wear and tear of eccentric thrust.
Large capacity, factory-packed, lubricant chamber assures carefree lubrication for vehicle life. No need for grease fittings or oil lines.

Exclusive features protected by U.S. patents Nos. 1958725 and 2140818

Aetna T-TYPE Clutch Release BEARINGS

WITH THE... ...THAT TAMES TROUBLE

Testing Motor Vehicles and Planes in Arctic Conditions

By Harry C. Plummer

'WAY below zero temperatures through the seven months' winter of the Canadian Northland pose distinct and enigmatical problems for automobile, aircraft and petroleum engineers. So far as passenger cars are concerned, it is an "automobileless land" and the absence of anything remotely resembling a continuity of common roads, let alone highways transitable for motor trucks. Nevertheless, a nascient industry, centering in the mining of the strategically vital uranium ores and gold and the baser metals, plus a flourishing production on the ground of both crude and refined petroleum, provide constantly expanding oil markets, especially so at the huge corporate mining operations at Yellowknife and Eldorado Mines (Crown-maintained) in the Northwest Territories, and at Dawson and Whitehorse in the Yukon Territory.

Close working co-operation between the Royal Canadian Air Force and the Royal Canadian Army, on the one hand, and the automobile aircraft and petroleum industries of Canada on the other, has evolved a continuous program of research and experimentation into the variable factors of use and care of equipment under excessively low temperatures common to the sub-Arctic and Arctic areas of the continent. As those areas extend over 3,462,108 square miles, or approximately one-third of the land surface of the Dominion, the operation is one of cardinal importance to the military security of both Canada and the United States.

Military Research Program

How vitally the RCAF regards the work now in progress and the results that are coming from it may be gaged by a recent Ottawa statement:

"A study of the globe will reveal that the shortest route between the United States or Canada and any potential enemy, which, obviously, must be in the northern hemisphere, is over the Canadian Arctic. That area and our ability to operate within and over it, at least with air-power, therefore, are of supreme importance in our defense plans for any future war."

And, with particular reference to ground vehicles, a high National Defense authority voiced the position that "the Army must be prepared to move under any type of snow and ice * * * it cannot choose which."

Work at Winter Experimental Stations of both of the aforesaid Armed Services will further research into structural principles, materials and fuels, especially the latter. Naturally, some of the findings are "top secret." Most, however, are passed on to civilian aircraft and automobile manufacturers and operators. The RCAF, this season will continue tests with jet aircraft, now in general use by the Air Force. It is expected that those tests will be of definite value to Canada's own jet plane industry. The aeronautical engineers concerned, although unable to divulge details on past jet-testing, have satisfied themselves that jet-propelled aircraft in many ways are well adapted to Canadian climatic conditions. The Vampires, they aver, are easily started under extreme cold, an important factor.

(*Turn to page 68, please*)

THE REAL REASON FOR RIBS...

Brake drums in heavy duty service are subject to *severe flexing stresses* imposed by the pressures of of the shoes, tending to stretch the drum out of shape; and high temperatures, sometimes running to over 1000°. The characteristic ribs on GUNITE Brake Drums look like cooling fins but are not. Their purpose is (1) to stiffen the drum and hold it in shape against the shoe pressures, (2) to permit the use of thinner sections and thus reduce internal compressive and tensile stresses that produce "heat check", and (3) to permit axial expansion of the braking surface at high temperatures, further tending to prevent heat check and breakage. The GUNITE rib design was developed by hundreds of gruelling over-the-road tests and its effectiveness has been demonstrated by a thousand million miles of silent proof. *Buy RIBBED Gunites for heavy duty braking!*

Write for our new folder giving further information on the advantages of ribbed drums.

MADE BY
GUNITE FOUNDRIES
ROCKFORD, ILLINOIS

GUNITE CAST WHEEL ASSEMBLIES FOR TRAILERS AND TRUCKS INCLUDE FAMOUS GUNITE BRAKE DRUMS

KELSEY-HAYES

McKeesport, Pennsylvania Plant

Eastern Assembly Division

for Car and Truck Wheels!

Located in the East at the Source of Steel—On Main Rail, Highway and Water Routes.

This McKeesport Plant, the chief source of wheels in great 8-plant operation, is most economically located to supply eastern assembly plants. Right at the source of the world's leading steel production, and in the center of a remarkable water, rail and highway transportation system, efficiently serves every point in the east (and throughout the United States). By water, can even ship via the Ohio and Mississippi Rivers to southern points and the Pacific coast! It's for wheels of all kinds, for original equipment or changeovers!

KnowH ASSURES PROVEN PRODUCTS AT

KELSEY-HAYES WHEEL COMPANY

DETROIT 32, MICHIGAN

Wheels—Hub and Drum Assemblies—Brakes—"Vacdraulic" Brake Power Units—for Passenger Cars, Trucks, Buses—made by Kelsey-Hayes' 4 Michigan Plants and Windsor-Canada Plant • "Magdraulic" Electric Brakes • "Lathan" Vacuum Power Brake Equipment for Tractor-Trailers—made by Kelsey-Hayes' South San Francisco-Lathan Plant • Wheels—Hubs—Axles—Parts for Farm Implements—made by Kelsey-Hayes' French & Hecht Plant at Davenport, Iowa.

(*Continued from page 66*)

Arctic Cold Reveals Structural Faults of Planes and Cars

"Structural faults * * * becoming conspicuous under such conditions," assisted by an official Army report and the need for specially treating lubricants by a "diluent" are among key studies of the RCA. Temperatures of 60 and 70 deg below zero, particularly as they affect blowing snow that develops a consistency equal to sand and literally bites into the metal and rubber surfaces of automotive equipment.

The main purpose of the RCAF Winter Experimental Establishment based at Edmonton, Alberta, with detachments at Fort Churchill, Manitoba, and Watson Lake in the Yukon, where Arctic conditions generally can be counted upon, is to learn how to operate and maintain aircraft in extreme cold; the ultimate aim being an all-clime ship, capable of maneuvering under all types of weather, from Polar to tropic. But the WEE also concerns itself with problems arising from radio, radar, armament, emergency equipment, and clothing and equipment required for ground handling. Included in its tasks is research into the types of apparel, diet and working conditions essential for ground-crews laboring under extreme cold.

Highly volatile fuels heretofore were used to start aircraft at low temperatures. Those worked, but their drawback was that when working away from a main base, the fuel had to be transported and stored at advance bases. Another method, now believed to be closer to the final answer, is to put regular fuel into intake manifolds under extra pressure through smaller jets. An additional pump is needed to give the increase pressure for evaporation at lower temperatures.

Test flights are arduous, often monotonous tasks. They call for careful preparation, skillful execution, and accurate analysis. Like other test flying, the job calls for much more than mere flying. So a posting to WEE as a pilot signifies that the officer is an experienced, highly-rated flyer. Constant attention must be paid to readings on numerous instruments, and cameras are ofttimes used to record multiple readings at intervals during certain types of research. Aircraft in their development stage are not sent to WEE; all planes tested there already have been proved under normal conditions.

Problem of Preheating Group of 75 Fighters

Aside from inability to fly due to weather conditions, there are few flights which cannot be made providing time and heat are available as starting aids. Those are readily at hand for commercial use; the only drawback expense. For military purposes, although the problem entailed in preheating a group of 75 fighters would be formidable, heat can also be made available. But time is a vital factor and cannot be ignored. Two major problems must be taken into consideration in solving the problem. First, the turning over of the engine; second, the firing of the fuel mixture.

The first has in itself two aspects. The effect of cranking an engine at 60 deg below may be imagined. But the difficulties are not in proportion to the temperature fall. They increase rapidly with each drop of a few degrees. In cold weather a motor-car battery rapidly loses its power. This, in turn, affects the compression obtained in the cylinders and, so makes starting more of a problem; in an aircraft, with its much larger engine, that is magnified.

There remains the supplying to a cylinder a flow of fuel mixture in such a form that the spark will ignite it. The fuel must be in a partly atomized state, a condition difficult to obtain at an extremely low temperature.

In winter a motorcar windshield frosts up, making driving dangerous. Similarly, in an aircraft, does the pilot's windshield, rendering take-off and landing particularly hazardous. At the moment, various devices similar to those for car use—wipers, heat, alcohol spray and the like—are employed both for commercial and military aircraft, but

(*Turn to page 70, please*)

THE RIGHT BALL

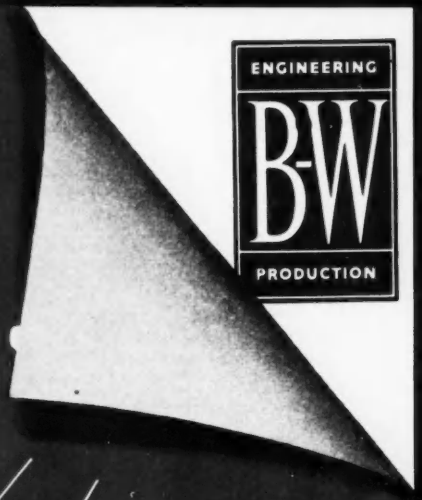
Let Strom Help You

Not only in precision ball bearings, but in countless other places, Strom has found that the right ball will do the job better. Maybe your problem can be solved with the use of the proper ball. Why not take it up with Strom.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

Strom STEEL BALL CO.
1850 So. 54th Ave., Cicero 50, Illinois
Largest Independent and Exclusive Metal Ball Manufacturer

Somewhere along the line...



19 out of the 20 makes of Motor Cars embody essential parts engineered and produced by BORG-WARNER

THESE UNITS FORM BORG-WARNER, *Executive Offices, Chicago:* BORG & BECK • BORG-WARNER INTERNATIONAL • BORG WARNER SERVICE PARTS • CALUMET STEEL • DETROIT GEAR • DETROIT VAPOR STOVE • FRANKLIN STEEL • INGERSOLL STEEL • INGERSOLL UTILITY UNIT • LONG MANUFACTURING • LONG MANUFACTURING CO., LTD. • MARBON • MARVEL-SCHEBLER CARBURETOR • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • MORSE CHAIN CO., LTD. • NORGE • NORGE-HEAT • NORGE MACHINE PRODUCTS • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • SUPERIOR SHEET STEEL DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WARNER GEAR CO., LTD.

have not yet been found to be completely satisfactory.

Contraction of Aircraft's Metal Parts

Unless the various metals employed in an aircraft's main construction and in control cables, oleo legs, air, oil and fuel systems, have the same, or nearly the same, rate of contraction, difficulties crop up at extremely low temperatures and must be overcome by substitution of new materials or some device to offset the differential contraction. But difficulties in the basic parts of the aircraft are not all. There still are the various radios, guns and other incidental equipment which do not function normally in cold conditions due to the congealing of grease and differential contraction. All the faults must be investigated and a solution found before the next job can be tackled. With new equipment being constantly produced, new problems arise.

As work progresses at Edmonton, at Fort Churchill and at Watson Lake, it is realized that the problems are even greater than were originally contemplated. Each new detail of equipment presents its own peculiar problems, which can only be tested and overcome in field trials. Laboratory results do not provide the final answer. So the policy has been changed. Now the latest types of aircraft and other equipment destined for use in any of the co-operating services are supplied to the unit for test purposes, the minimum below-zero temperature required for which is 30 deg.

Penguin II, Newest Model of Snowmobile

From the investigation has come the evolution of the Snowmobile, a lumbering chain-gear driven vehicle for negotiating the snow and ice wastes of the Western Arctic, and the tractor-train. The former, embodied in the latest Army model, the Penguin II, is reported to have been found far from satisfactory for military purposes. The latter has become indispensable for the movement of emergency freight over the snow-blanketed terrain and ice-locked rivers and lakes during the winter; much more costly than the steamer and barge transport of summer, but much less so than the freight plane services. It consists of a $12,000 to $15,000 standard caterpillar tractor, hauling 28 cargo-sleds equipped with runners of steel tubing and a caboose which is both "dining-car" and crew quarters. A scout plane aloft signals dangerous fissures in the ice of such bodies of water as the Great Slave and Great Bear Lakes, each averaging the equivalent in area of the land surface of Massachusetts and Connecticut combined, and the Mackenzie River, which ranks next to the Mississippi among streams on this continent.

Fixtures for Building Bus Bodies

(*Continued from page 44*)

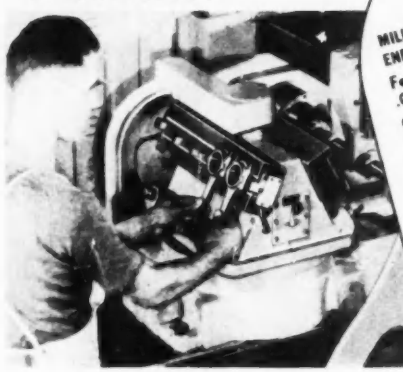
can be changed for similar models, the same as the roof fixture.

Sub-assembly fixtures include those for building trusses, rail or belt and skin assembly, lower rear and upper rear, and lower and upper front and front splice, and various small parts. Windows and doors are assembled separately in fixtures and delivered to the final line ready for insertion.

To forestall hammering or prying during window and door glass assembly, Twin Coach devised a special table fixture. Glass is placed in aluminum extrusions, which have been previously cut and bent to size, then a manually operated cam lever forces all together tightly, and the assembly is sealed and completed with riveting. Window and door fixtures can be varied in size by the removal and replacement of positive locating pins.

Extensive assemblies, after pieces are placed in fixtures, are brought into tension for more accurate fitting through the use of web belting which goes over and around assemblies and is tightened with self-locking clamps. These belts (sometimes called elastic ropes) are especially helpful on "clean-up" fixtures. The latter receive large top and chassis assemblies after they leave the main fixtures described above. On "cleanup" fixtures, workers are enabled to get at and rivet odd places, inacessible while the assemblies are in the main fixtures.

DEEP MAGNETIC PENETRATION



MILLING SLOTS IN SMALL END OF CONNECTING RODS—
Feed — 5-3/4 Inches per Minute
.002 Inch Chip per Tooth
Cutter — 3 Inches in Diameter
400 per Hour Approximate.
See this new technique demonstrated. Where groups can be arranged, we will demonstrate Deep Magnetic Penetration without cost or obligation. Send us names with company positions. Write now, to reserve an early date.

A NEW *Production* WORK HOLDING TECHNIQUE

Save hours of costly tedious clamping and unclamping on production milling operations with this new Power-Grip holding technique.

Deep-penetrating magnetic poles, the full length of the Viking Chuck, provide power that holds work securely against high speed machining cuts.

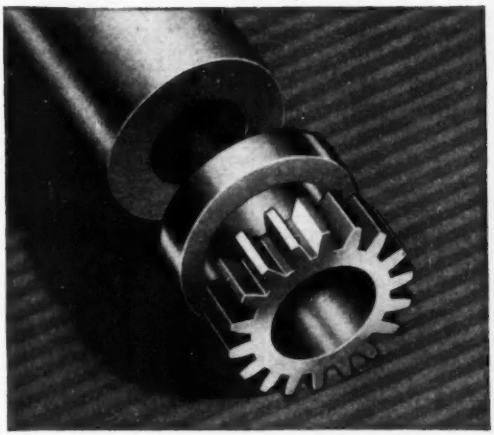
Get the complete story today on how to eliminate expensive fixtures and simplify work holding. Write for the new 1949 edition of Magnetic Holding Methods.

Send prints and specifications for estimate on Power-Grip Holding for your Production Jobs.

ROCKFORD MAGNETIC POWER-GRIP CHUCKS

ROCKFORD MAGNETIC PRODUCTS CO. INC.
1314 18th AVE. ROCKFORD, ILLINOIS

Two ways TIMKEN® seamless tubing cuts costs on hollow parts



1. No hole to bore

The first step in production is already finished when you use Timken® seamless tubing instead of bar stock for making hollow or ring-shaped parts. There's no hole to bore, less waste stock to pay for. Elimination of drills on automatic machines often leaves space for other tools, sometimes speeding production as much as 200 per cent!

Timken seamless tubing offers you a range of sizes up to 10½″ O. D., covering a wide variety of requirements. Rigid control throughout every step in manufacture results in steels of fine forged quality and refined grain structure, with uniform machinability and heat-treating. This means a better product for you, with fewer rejects and increased customer satisfaction.

2. TIMKEN® tube engineering service gives you the most economical tube size—guaranteed to clean up.

When you make use of Timken tube engineering service, you can be sure of minimum machining time—maximum saving of metal. That's because the Timken tube engineering service takes full responsibility for giving you the most economical tubing for your particular job—and guarantees that it will clean up to your dimensions. We take all the risk!

This guaranteed service is made possible by the outstanding uniformity of Timken tubing and by the largest assortment of roll sizes of any mechanical tubing mill in the country. Get details of this service now—without cost or obligation. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing

Taxes and Demagoguery

(*Continued from page 38*)

is completely silent as to labor practices on the part of labor unions and officers of labor unions.

Such legislation contravenes the basic precept of "equality in the eye of the law." Such laws, therefore, strike at the stability of government, threaten the ultimate health of our economy and the integrity of our social sructure.

Thus monopolistic unionism cooperates with confiscatory taxes in threatening to throttle freedom and to force the people of the United States to abandon beneficial social, economic and political usages that were founded upon long-proven precepts — upon unchanging natural law.

While it is very helpful to keep in mind always a clear conception of our basically fine, strong, American anatomy which conforms to the requirements of unchangeable natural law, we must deal effectively and quickly with forces which threaten to drive us from a culture of individual freedom into conditions under which the state, instead of being the servant of the people, is fast becoming their master.

The forces which are driving us toward socialism had their inception many years ago and gradually have assumed such magnitude that their suppression may soon become impossible.

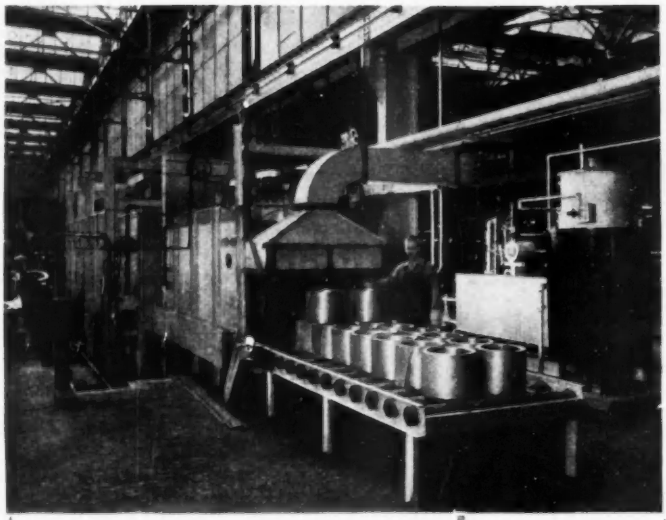
As we study the rise and fall of republics, demagoguery seems gradually to increase its influence until statesmanship is superseded. We, the people, are, of course, fully responsible. Our ignorance, indifference, complacency and slothfulness with respect to our own government permits the demagogue to rise and shine. Daniel Webster once remarked, "God grants freedom only to those who love it and are always ready to guard and defend it."

The demagogue is defined as one who influences the people by pandering to their prejudices and passions. Every man who holds elective office in a republic must, of course, be a politician, if one conceives a politician to be a person who must maintain the loyalty of a dominant constituency. The politician who holds the loyalty of his constituency and who develops and supports measures that promote the continuing welfare and development of the state—who works consistently for the greatest ultimate good of the nation—is a statesman. He is also a very rare bird — one who becomes scarcer and scarcer as the republic grows older.

The politician who buys the support of his constituents by appealing to class prejudice, by promising something for nothing, by yielding to pressure groups—the politician who squanders the taxpayers' money, who corrupts the courts of the land, who sacrifies principle upon the altar of political expediency—is the demagogue whose influence destroys the nation from within.

As the demagogue gains authority, great bureaucracies develop which restrict freedom, waste the substance of the nation and multiply the destructive influence of the demagogues. The influence of big demagogues in executive and legislative positions is multiplied by thousands of little demagogues who infest the bureaucracies.

The demagogue follows a tested pattern that has not varied through the ages, be it the Emperor Diocletian's gift of bread and circuses to the Roman people, or Huey Long's slogan, "Every man a king," or quite recent political promises that wages can be advanced without increasing prices. The demagogue promises the populace something for nothing—"redistribution of wealth." Such catch phrases, as old as human history, really mean the end of a self-sustaining economy. They mean confiscatory taxes which destroy incentive and reduce investment, thereby arresting economic growth. Such popular propaganda means that, unchecked, our pied pipers of politics and unionism eventually will lead us to lower living standards and to national disintegration.



SCALE-FREE FINISH ANNEALING BRASS STRIP IN COILS

• The E F gas-fired roller hearth furnace pictured above scale-free finish anneals brass strip at temperatures ranging from 900°F. to 1450°F. . . . has burner capacity to heat 5000 pounds per hour to 1450°F.— *60 tons per day.*

This furnace is one of E F's direct gas-fired semi-continuous intermittent operating designs, with separate chambers for preheating, annealing and cooling. Special ratio control burner equipment produces the exact atmosphere desired. An ingeniously designed forced circulation system assures accurate temperature distribution — and uniform anneal and surface finish—day after day.

E F research, E F design, and E F experience have greatly advanced the metallurgical processing of ferrous and non-ferrous metals, resulting in closer physical tolerances, more uniform results and more efficient, low cost, trouble-free operation. Let us work with *you* on *your* furnace problems!

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CARBON RESTORATION
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GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

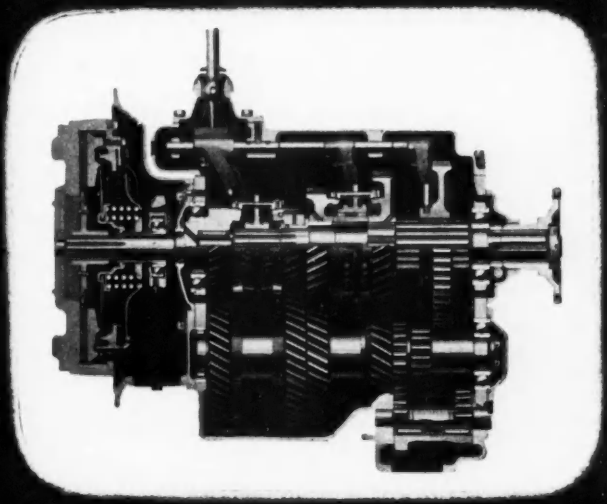
Salem - Ohio

The Purpose of the

Spicer

Synchronized Transmission

The Spicer Synchronized Transmission is a perfected gear mechanism that works hand in hand with the human ingenuity of the truck driver. Together, they assure an easier job for both: each making the other more efficient, assuring more productive horsepower put into the wheels and more ton-miles handled each day.



The Advantages of the Spicer Synchronized Transmission

Faster Shifts

No Missed Shifts

Fast Getaway

Less Vehicle Slowdown when Shifting

Down Shifts Made Without Slowdown for Double-Clutching

No Lugging of Engine

Shifting Lever Travels Same Distance Every Shift

Savings in Fuel

Lower Vehicle Upkeep

Spicer engineers will help your vehicles move more tons at less cost per mile, by adapting the Spicer Synchronized Transmission to your individual needs.

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Division of Dana Corporation
TOLEDO 1, OHIO

45 YEARS OF Spicer SERVICE

TRANSMISSIONS • PASSENGER CAR AXLES
CLUTCHES • PARISH FRAMES • STAMPINGS
TORQUE CONVERTERS • UNIVERSAL JOINTS
SPICER "BROWN-LIPE" GEAR BOXES
RAILWAY GENERATOR DRIVES

The Improved Offenhauser Midget Racing Engine

(*Continued from page 34*)

Connecting rod bearings are steel-backed inserts, 0.050 in. thick, with tin-based babbitt 0.003 in. to 0.005 in. thick, used for lining material. Main bearings are carried in manganese bronze supports bolted to webs in the crankcase. Babbitt lining is bonded directly to the bronze supports and is 0.015 in. thick. It is planned to have inserts also for the main bearings at an early date as this method will reduce maintenance costs.

Pistons are aluminum alloy, permanent-mold castings, and weigh approximately 10 oz, finished. Three or four piston rings are optional, although it has been found that three rings are satisfactory. Compression rings are 1/16 in. wide while the oil ring is ⅛ in. wide. Piston pins are 13/16 in. diameter, made from 4340 steel, and are the full-floating type with aluminum retaining buttons. Piston skirt clearance is 0.007 in. while the top land clearance is 0.024 in. Pistons are made in a variety of compression ratios ranging from 7 to 1 up to 16 to 1, to suit types of fuel used and kind of performance desired. In connection with high compression ratios, detonation is apt to occur if the fuel is not suitable or the fuel-air mixture is incorrect.

Lubrication is by a double oil pump operating at one-half engine speed. Oil pressure is carried to all main and connecting rod bearings at 80 psi, and to camshaft bearings where it is reduced to 5 psi. The scavenging side of pump returns oil to the tank through ⅝ in. ID. tubing. Number 50 SAE oil is commonly used and the operating temperature is around 180 F. Oil filters are desirable, especially on dusty tracks. Engine cooling is by a centrifugal water-pump, driven by the oil pump shaft at half engine speed, maintaining a water temperature of 180 F. The pump impeller is 3 in. in diameter.

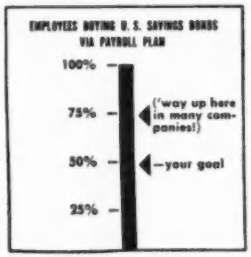
Ignition is by a special racing magneto turning at engine speed and driven through bevel gears. Spark plugs are 18 mm, with the so-called cartridge type firing. Plug location is on engine center-line but offset 11/16 in. longitudinally. This arrangement prevents tendency of cylinder dome cracking between valve seats. Spark setting is usually around 35 deg btc.

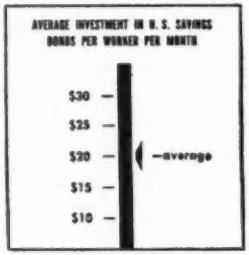
Two side-draft 1-½ in. Riley racing carburetors deliver the fuel mixture to the cylinders through a common manifold. These carburetors are the conventional float type, but modifications are being made to overcome the ill effects of vibration and to provide a constant fuel level at all throttle positions above the low ranges. Normally one fuel pump is used. It is a vane type, driven from the rear end of the exhaust camshaft, and has a capacity of 35 gallons per hour. Experiments are also being carried out with fuel injection, spraying into the intake manifold ahead of the intake valves with favorable results.

No engine starter is required as all midget racing cars are either pulled or pushed for starting and of course, no fan or generator is needed on a racing engine. However, arrangements are being made to incorporate these items on special order. This is done primarily for sports-car manufacturers who wish an engine of this type. Other modifications would also be made, such as silent camshaft drive, suitable compression ratios, etc. The engine turning 6000 rpm will develop 100 hp with 7 to 1 compression ratio, using methanol fuel and 88 hp using regular service station leaded gasoline.

Jigs and fixtures are quite complete and all component parts are interchangeable, making a production rate of an engine a day possible with present equipment.

How is YOUR company doing in this "EVERYBODY-BENEFITS" plan?





If the figures for your company fall below those shown above, you're missing your share of benefits of the Payroll Savings Plan! Nation-wide experience proves that when top management puts the "OK" on the Plan, its benefits rise sharply.

Benefits to *Employees* — Every $3 invested in Savings Bonds pay $4 at maturity. Workers gain (1) the means to buy in the future more of the things they will want; (2) the peace of mind that goes with regular saving.

Benefits to *Employers* — Participation in Payroll Savings makes workers more contented. Worrying less, they work better. Among the more than 20,000 large companies with Payroll Savings, records show that worker production increases, absenteeism and accidents decrease as payroll savings participation rises.

Benefits to the *Nation* — The Payroll Savings Plan is a powerful deterrent to inflationary forces. Every Savings Bond dollar built up in the Treasury withdraws a dollar from the swollen spending stream, aiding national security.

What can *You* do? — If your company has the Payroll Savings Plan, make sure it's adequately promoted by your top executives.

If you haven't yet installed the Plan, why pass up its benefits any longer? All the help you need is available from your State Director, Savings Bonds Division, U. S. Treasury Department. Call him today!

The Treasury Department acknowledges with appreciation the publication of this message by

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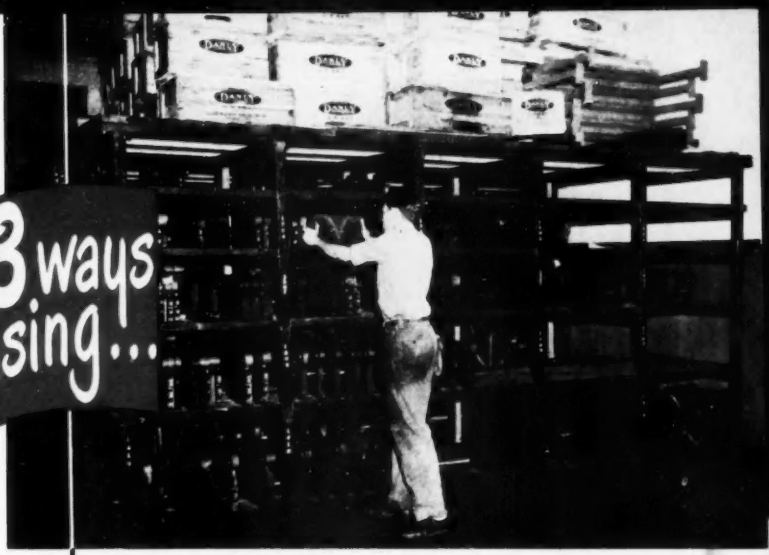


A portion of the stock room in a Danly assembly branch where component parts of Danly die sets are stocked awaiting assembly to your specifications. It is this specialized service that is so much a part of Danly's facilities that help you save time and avoid production delays.

you save time 3 ways using...

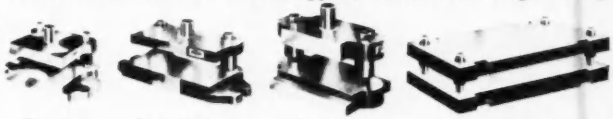
DANLY *Precision* Die Sets

1 Precision Insures Long Die Life... Cuts Downtime

The more highly controlled accuracy of Danly Precision Die Sets results in longer production runs between die regrinds. Stamping quality and uniformity are also improved.

Guide posts and bushings of each Danly Precision Die Set are ground and lapped with final lapping of bushings after assembly. Assembled accuracy is inherent. This means accurate die closure in the press setup, giving you longer die life and lower production costs.

2 Wider Selection of Standard Types, Plus Interchangeability



Regular Back-Post Set | Long Narrow Back-Post Set | Standard Center-Post Set | Large Special 4-Post Set

Consult the Danly catalog for a wider variety of standard types of die sets. For example, in any one of the many types, there are several thousand interchangeable combinations, each to suit specific needs. Interchangeable replacements, including any single component of the die set, offers substantial savings in time, giving you flexibility and worthwhile economy.

3 Danly Nationwide Assembly Service Speeds Deliveries

Assembly plants are located in major tool and die centers. Here, variety and prompt service are available to your door ... a real saving when time is important ... use the Danly branch in your area to save time and reduce costly delays.

Call on the Danly Branch nearest you

Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit your specifications.

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- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan St., N.W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- • **Milwaukee 2,** 111 E. Wisconsin Ave.
- • **Philadelphia 44,** 18 W. Chelten Ave.
- ★ **Rochester 4,** 16 Commercial St.

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With the largest and most completely equipped organization in the well water developing field, Layne has always provided excellent service for even the smallest plants. In no case have they had to pay a penalty for Layne's world-wide experience and outstanding success. As a matter of fact, Layne Well Water Systems actually cost less when the advantage of unquestionable high quality, proven efficiency and extra long life are considered.

Small plants receive the same professional engineering, skillful workmanship and high quality equipment as is always provided for the largest industries. The only difference is in the size and capacity of the units installed. Several thousand small plants already have their own Layne Well Water Systems. All are highly pleased with their sound investments: the economy of operation cost and the complete dependability of the units at all times.

Small plants of all kinds;--mills, factories, theaters, food processors, packers, railroads, ice plants etc. are invited to make inquiries and to obtain catalogs about Layne's complete service which includes surveys, water strata, explorations, well drilling, pump installations etc. for a complete, thoroughly tested and in operation well water system. No obligation. Address LAYNE & BOWLER, INC., General Offices, Memphis 8, Tenn.

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SAE Meeting

(*Continued from page 47*)

ter how long it may be soaked at furnace temperature.

4—It provides complete surface protection without special apparatus.

5—It has been established by hundreds of installations that distortion, caused by heat treatment, is drastically reduced.

Briefly, the recently developed applications of interest to the automotive industry are as follows:

Austempering: This is a recent development which produces high physical properties together with a phenomenal control of distortion in a very short time.

Martempering: Of the recent developments, this is one of the most outstanding. High hardness, comparable to water or oil quenching, is available with a remarkable control of distortion. Martempering is often combined with carburizing, and the entire treatment is accomplished with one heating.

Cycle Annealing: This is a recent development which takes advantage of isothermal transformation to secure, in a short time, the soft structures required for machining. The first commercial application was made on centrifugally cast cylinders of cast iron which were used in the manufacture of cylinder sleeves and piston rings. The iron is given substantially improved physical properties combined with good machinability. The application of cyclic annealing to quantity production of forgings utilizing the residual heat of the forgings as they come from the press is also being tried out on a large scale, but it is too early yet to give specific data on its performance.

Steel Forming and Drawing

By C. L. Altenburger

When one thinks about the relationship of steel characteristics to the many processes involved in the forming of metals, attention is generally riveted on ductility. Also a very common property often looked at with considerable interest is hardness.

This is so—at least partly—because steels which give good performance in a given set of dies fall within certain ranges of hardness and ductility, and partly because dies are worked in on a given grade of steel.

Neither of the two properties above—per se—and especially when taken singly predetermine the drawability of steels, for we can have steels that are soft and brittle and steels that are comparatively hard and ductile. Also we can have steels that are soft and ductile at low rates of strain but which are brittle at higher rates of deformation. Some steels exhibit ductility against simple types of stressing but are brittle under more complex types. Also yield points, tensile strengths, fracture strengths, ductilities and total flow curves vary with the complexity of stressing, some steels being more variable in this respect than others. Modern deep drawing steels were not developed by recognizing the above frightening and imposing array of variables. Indeed their development took place by the application of practical knowledge gathered by cooperation between producer and consumer, and was mostly completed before the ideas enunciated above were recognized.

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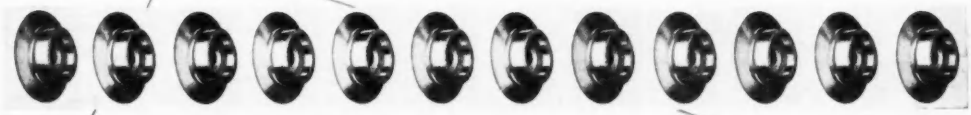
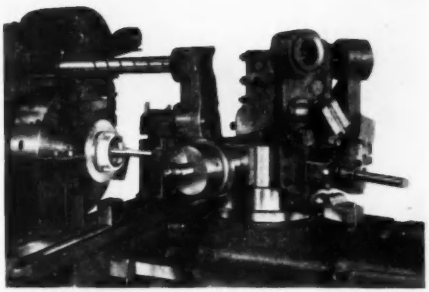
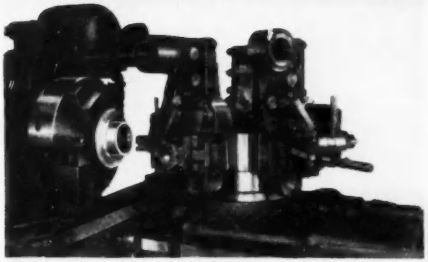


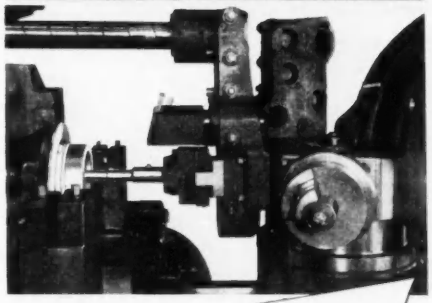
PRODUCTION MEN FIND

fewer rejects

FROM P&J AUTOMATICS







The automotive industry applies Potter & Johnston Automatic Turret Lathes extensively to quantity production of interchangeable parts, many so intricate that they require upwards of fifteen to twenty successive operations on one machine. Significantly, the modern quality control inspection methods used in the big automobile plants demonstrate the ability of P&J Automatics to produce work that meets these exacting standards . . . with fewer rejects.

Back of this successful performance record is P&J tooling . . . as planned with the aid of experienced P&J engineers who know how to work out a job — as indicated by these setups to produce the differential case pictured above — operation by operation in correct sequence, turret face by turret face. There is no substitute for the skill and know-how of these men. That is why Potter & Johnston machines plus P&J tooling mean better parts and more of them at lower cost. And that is why we suggest that it may be very much worth your while to send us sample parts or prints and see what we have to recommend.

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Pawtucket, R. I.
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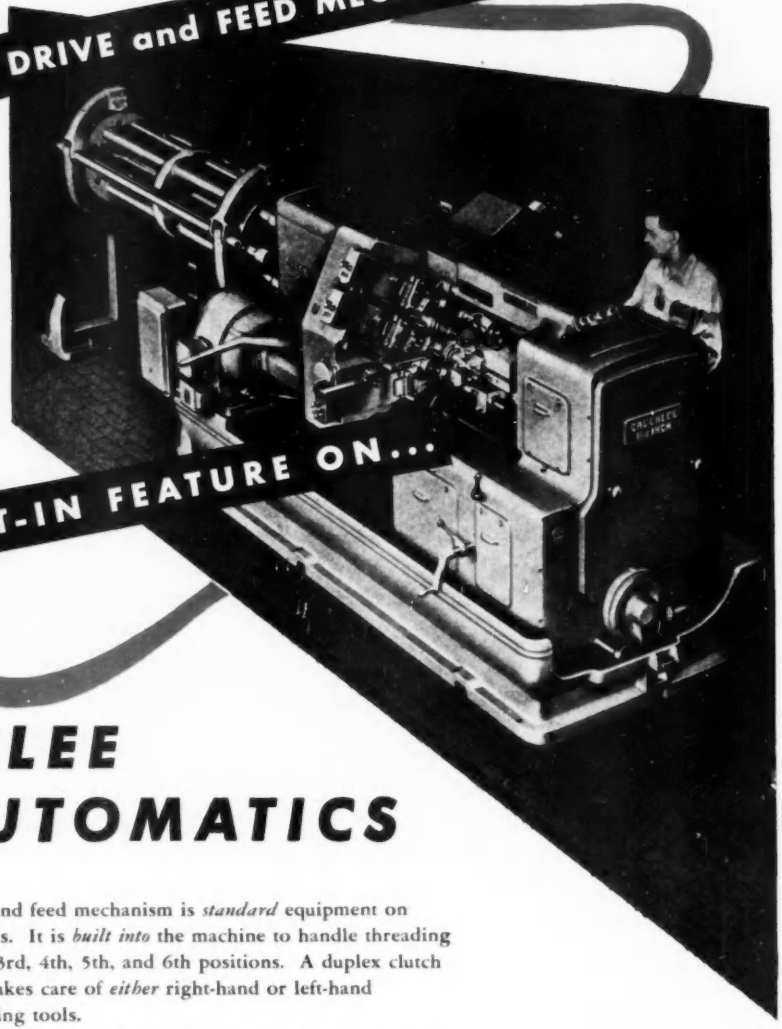
P&J

AUTOMATIC
TURRET LATHES

THREADING DRIVE and FEED MECHANISM...

IS A BUILT-IN FEATURE ON...



GREENLEE AUTOMATICS

● A threading drive and feed mechanism is *standard* equipment on Greenlee Automatics. It is *built into* the machine to handle threading attachments in the 3rd, 4th, 5th, and 6th positions. A duplex clutch and shifting lever takes care of *either* right-hand or left-hand threading and tapping tools.

For ease and speed in set-ups and job-changes, Greenlee's *universal tooling* is the answer. *Interchangeable* tool holders fit any cross slide cavity . . . can be changed quickly . . . and insure precision and uniformity in the production of duplicate parts. These outstanding GREENLEE features can greatly improve the efficiency of your production.

WRITE FOR LITERATURE — There are many more money-saving, cost-cutting features of Greenlee Automatics. Let us send you additional literature.

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GREENLEE BROS. & CO., 1754 Mason Ave., Rockford, Illinois

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750 POUNDS DEADWEIGHT SAVED

in these Mayari R sprinkler trucks

One of a fleet of lightweight sprinkler trucks operated by the City of Seattle. Shells of these all-welded Mayari R tanks contain 12-gage sheet, while the heads and baffles are made from 10-gage. Puget Sound Sheet Metal Works built the tanks. Kenworth built the trucks.

Weighing 750 lbs less than similar sprinkler truck tanks of carbon steel, these units are an excellent example of light-weight construction and lasting durability made possible with Mayari R.

In building these sprinklers for the City of Seattle, the Puget Sound Sheet Metal Works required a grade of steel with superior mechanical properties, high resistance to corrosion, and easy workability in the shop. Mayari R low-alloy, high-tensile steel filled these requirements and more.

Its yield point is 50,000 psi minimum, approximately twice that of plain carbon steel. It can be cut, punched, formed and welded by the same methods as those used with carbon steel.

In addition, Mayari R has better resistance to abrasion and denting, and it retains paint from 20 to 80 pct longer than does carbon steel of structural grade. These advantages coupled with its economy make Mayari R a logical choice for many types of truck frames and bodies.

For further information about versatile, weight-saving Mayari R and its uses in the truck-building industry, write our nearest sales office for a copy of Catalog 209.

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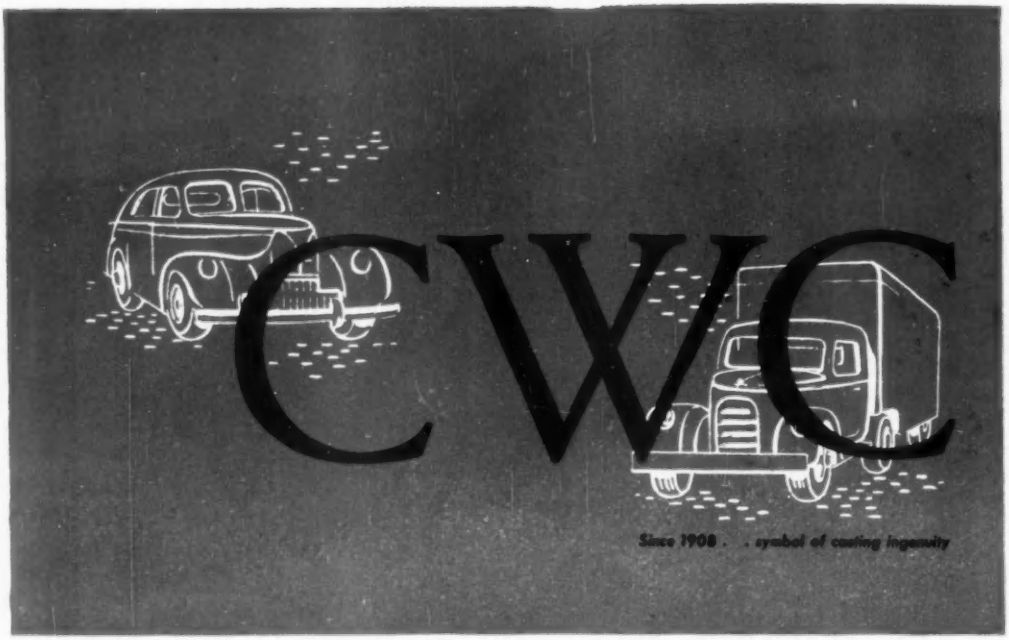

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Men in the automotive industry have long recognized CWC as the source of most that is new in casting iron and steel. Because of CWC advanced metallurgical engineering, precise control of the metal before it is poured, and mechanized facilities for volume production, great developments in castings have been made possible. From the five Campbell, Wyant and Cannon foundries come many thousands of *cast* cylinder blocks and heads, *cast* pistons, *cast* gears, *centrifugally cast* cylinder liners and revolutionary *cast* camshafts. These, and scores of other CWC castings are incorporated in leading automobiles, contributing to better design and operation, and to greater economy.

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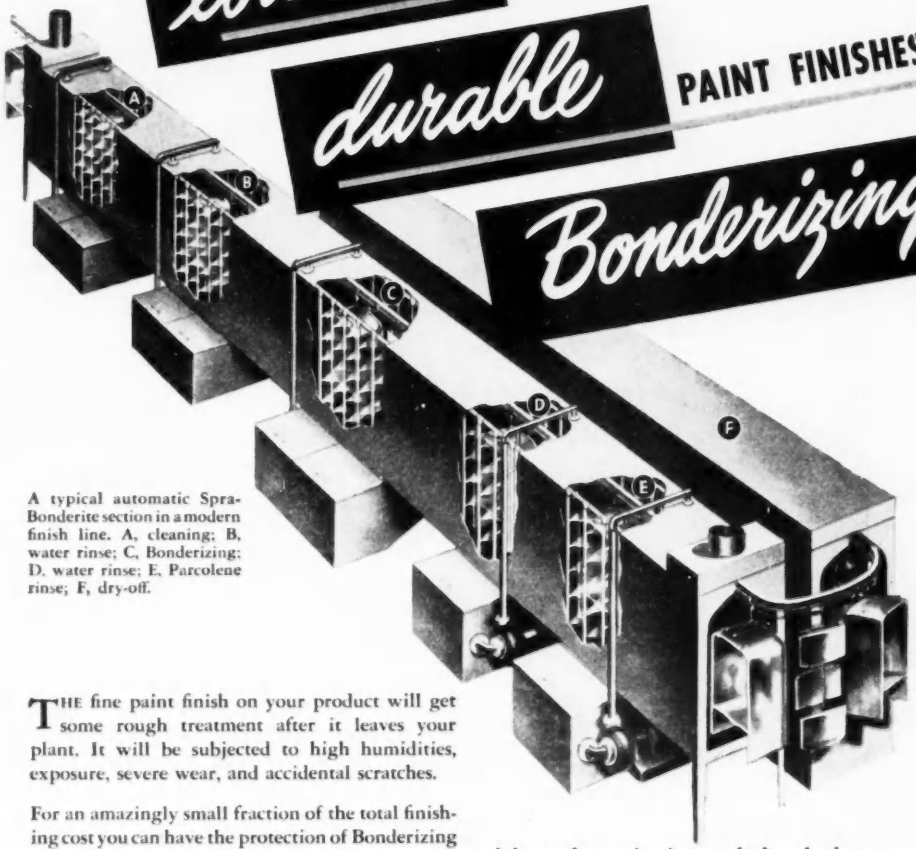

A typical automatic Spra-Bonderite section in a modern finish line. A, cleaning; B, water rinse; C, Bonderizing; D, water rinse; E, Parcolene rinse; F, dry-off.

THE fine paint finish on your product will get some rough treatment after it leaves your plant. It will be subjected to high humidities, exposure, severe wear, and accidental scratches.

For an amazingly small fraction of the total finishing cost you can have the protection of Bonderizing—assurance of a durable paint finish.

Bonderizing—quick, simple, and easy to control and apply—does these things to protect and preserve fine paint finishes:

It provides a secure anchor to hold paint. No chipping or peeling.

It retards corrosion effectively.

It checks the spread of rust at the site of the injury when paint is scratched or broken.

If your product has a paint finish, protect it and your customer's satisfaction by Bonderizing before you paint.

Full information is yours on request. A letter will bring you details on Bonderizing and what it can do for your product.

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

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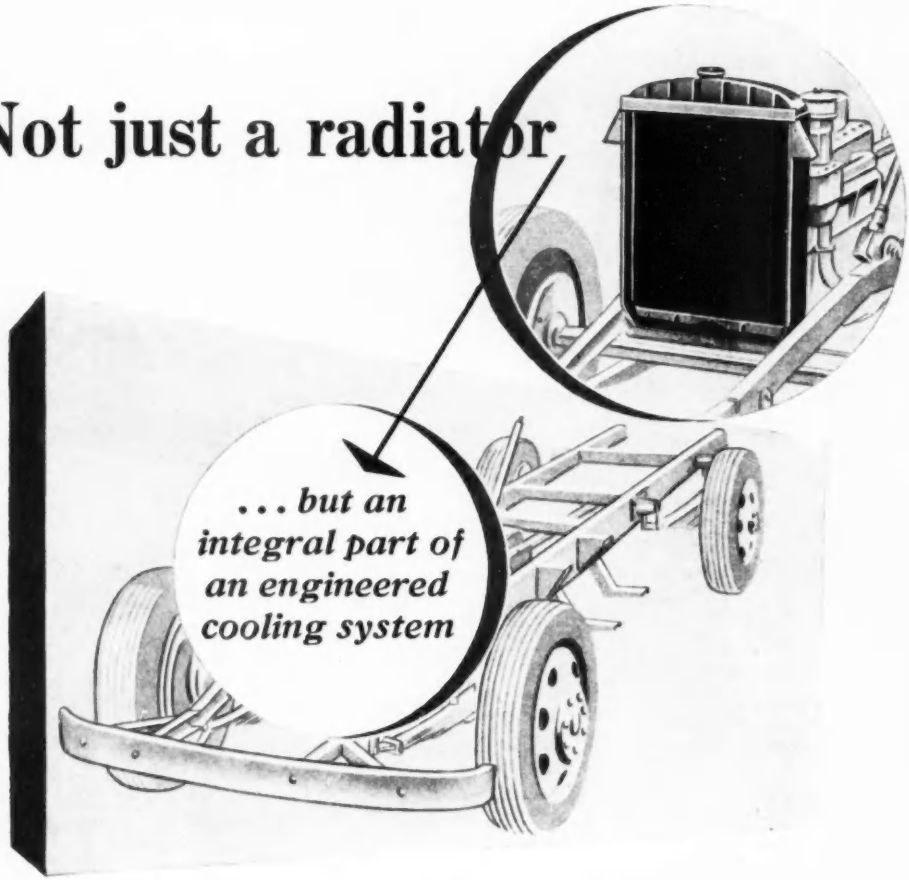
Not just a radiator



When a manufacturer of cars, trucks, buses or tractors consults Harrison on a cooling problem, some pretty important *cost savings* are likely to result.

Harrison tackles the *over-all cooling problem* . . . fan location, shrouding of the radiator core, restrictions to air movement, size of fittings, method of mounting and other factors. And Harrison's recommendations lead to an engineered cooling system that *saves* on core costs, *saves* on mounting costs, *saves* on parts costs.

Let Harrison's complete Testing Laboratories, extensive field experience and unmatched manufacturing facilities give you better cooling at lower cost. Harrison Radiator Division, General Motors Corporation, Lockport, N. Y.

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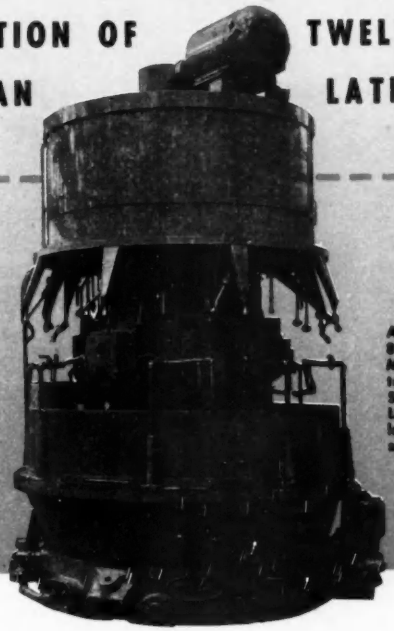
THIS ONE MACHINE

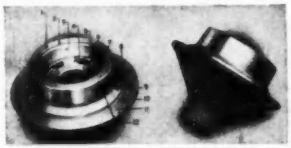
EQUALS THE PRODUCTION OF TWELVE TO FOURTEEN CAPSTAN LATHES

From Coventry, England, comes this enthusiastic report of the Standard Motor Co., Ltd., on the BULLARD Type D Mult-Au-Matic.



A BULLARD Type D 8-Spindle Mult-Au-Matic used in the up-to-date plant of the Standard Motor Co., Ltd., Coventry, England. Note the compact, space-saving design.

The work. A cast differential gear case, before machining.

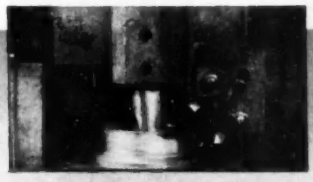


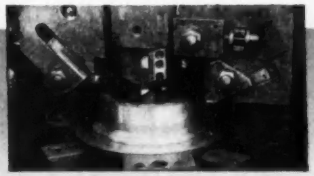
The same casting after completing one cycle (through 7 work stations) on the BULLARD machine. Arrows indicate the 12 machined faces . . . . Piece time: 2 minutes!

According to a leading British automobile manufacturer, the BULLARD 8-spindle Mult-Au-Matic is an excellent example of modernization of production machinery . . . with particular emphasis on its ability to perform 12 machining operations — entirely automatically — in 2 minutes' piece time! Case histories show why BULLARD Mult-Au-Matics are internationally recognized as outstanding among multi-spindle manufacturing equipment . . . key factors in the present world-wide effort to cut the time and costs of production.

BULLARD Mult-Au-Matics are rugged versatile machines designed to cut manufacturing cost on a wide variety of jobs. These are not exclusively high production machines since case histories show reduced manufacturing costs on short runs of work. Individual speeds and feeds at each station provide correct cutting conditions for various diameters, operations and a wide variety of cutting tools. Study the manufacturing economics of the Mult-Au-Matic Method as applied to your work. *The Bullard Company, Bridgeport 2, Connecticut.*

Send prints of your jobs for engineering estimates. Refer to ad MD 122





Close-ups of 2 of the 7 fully automatic work stations, showing several tools cutting simultaneously.

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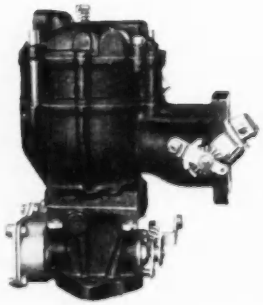

No one knows better than factory or maintenance engineers that economy is a long-range proposition—that if smoother, better all-around performance is assured, economy will inevitably follow. That is precisely why a large majority of engineers who know the problems of heavy-duty operation specify Zenith* carburetors for the job.

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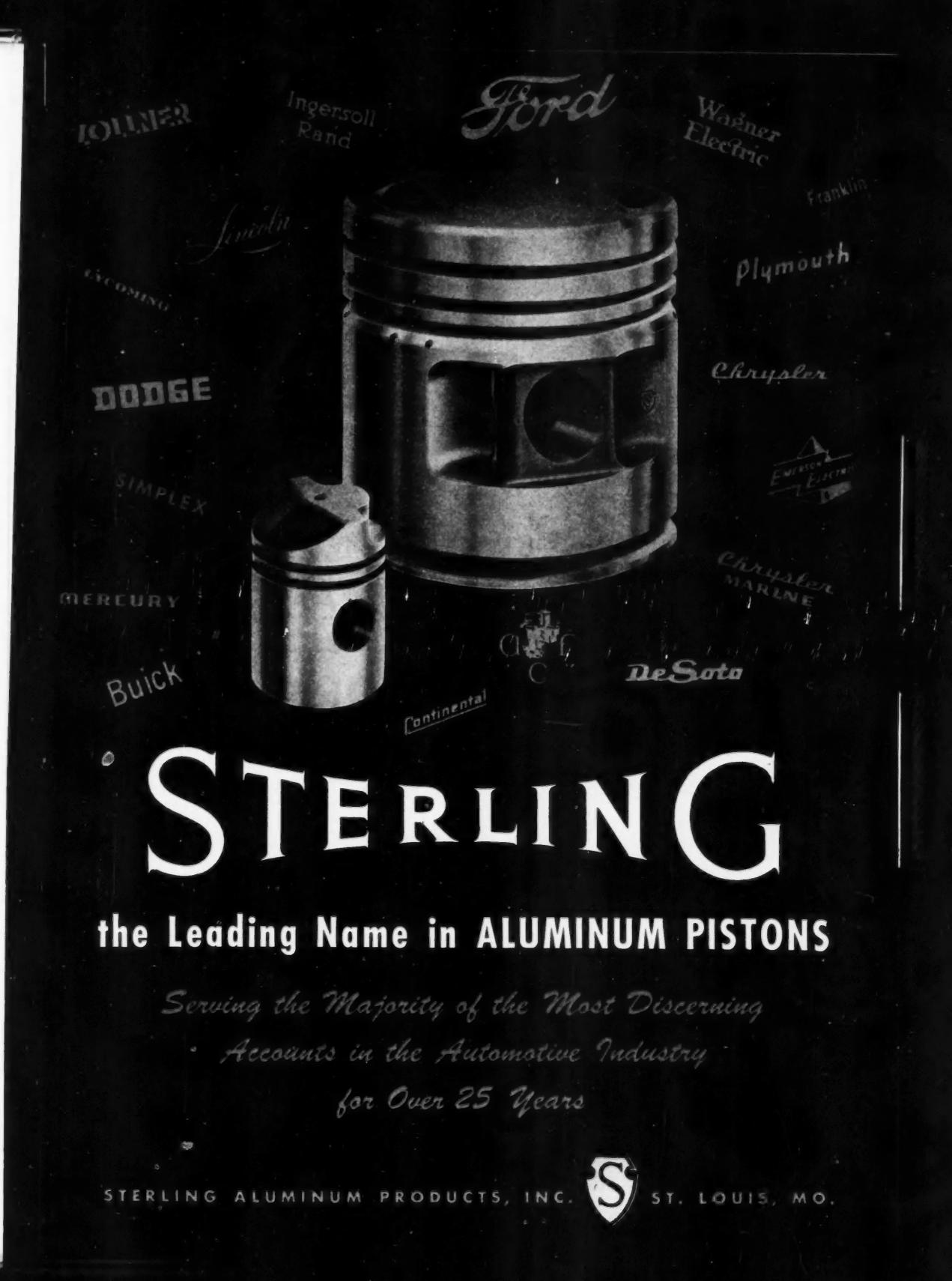

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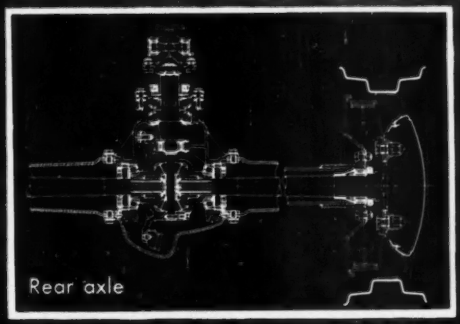

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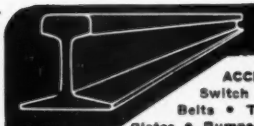

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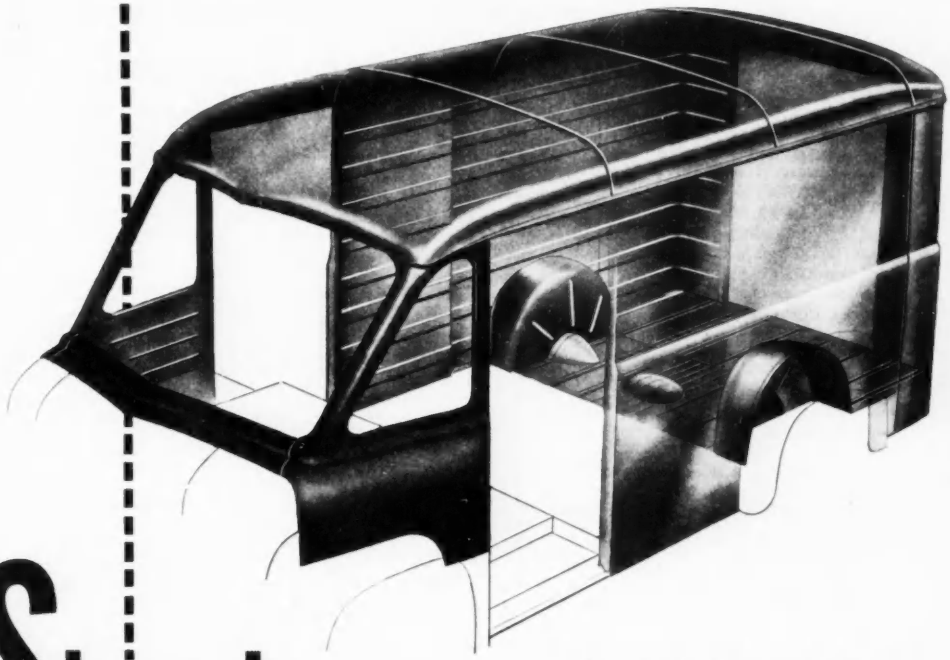

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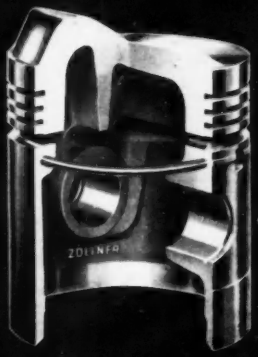

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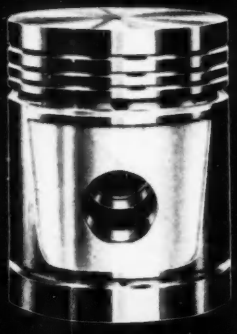

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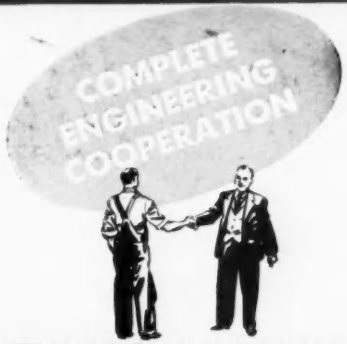

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